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NITRIDING . . .

What It Is
How It Is Done
Properties Obtained

By S. F. Cushman, Jr.
Factory Manager, Perkins Machine and Gear Company

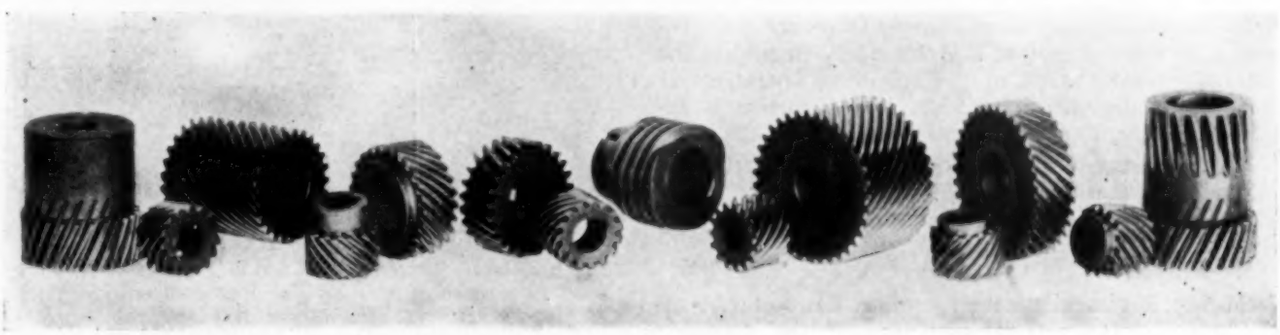
NITRIDING is the process of producing extreme surface hardness in special steels by means of nitrogen. Unlike casehardening, which is the process of adding carbon to the surface and then hardening by heating above the critical point and quenching, nitrided steels are not heated above the critical point, are not quenched, and are not air hardened. Of course, heating above the critical point and quenching followed by a drawing operation may be performed before the nitriding operation in order to obtain desired properties in the core, but is not necessary for the nitriding operation.

Ordinary low-carbon steels, as well as nickel and nickel-chromium steels, may be carburized. On the contrary, nitriding requires the special steels called Nitralloy if the extreme surface hardness is to be obtained. There are three standard compositions in use at present, the main difference being that the carbon content is varied to give different degrees of machineability and different core properties. These steels contain about 1¼ per cent of aluminum, about 1½ per cent of chromium, and 0.2 per cent molybdenum. The aluminum is supposed to play the leading part. The molybdenum imparts a greater degree of toughness to both core and case, especially if the steel contains nickel.

In carburizing, the parts are usually packed in a granular compound, which is mostly carbon, and heated to a temperature between 1,500 and 1,800 deg. F. for a number of hours. The carbon is taken up by the surface of the steel, so that, when the parts are later quenched, the surface behaves like a high-carbon steel and is hardened. In nitriding, the parts are packed in promoters in a gas-tight box, pure ammonia gas admitted, and the box and contents heated to about 950 deg. F. The hot ammonia gas breaks down under these conditions, its hot hydrogen being absorbed by the packing material, and its hot nitrogen being absorbed by the surface of the steel forming a solid solution of iron nitride which is extremely hard in its natural state at temperatures considerably above the nitriding temperature.

All of the details of what goes on in the furnace are not fully understood. Apparently there is a catalytic action, for the process proceeds much slower without the promoters, and will not take place at all in the presence of nitrogen only. Perhaps other materials than ammonia could be used, but this is the only one which has been developed for commercial use.

Because of the affinity of ammonia for water, and of the decomposed hydrogen for oxygen, it is important that the nitriding boxes be sealed air-tight. Otherwise, atmospheric moisture would get in, and the oxygen in the air would unite with the hydrogen liberated to form



A group of gears the nitrided wearing surfaces of which are much harder than the hardest alloy steel

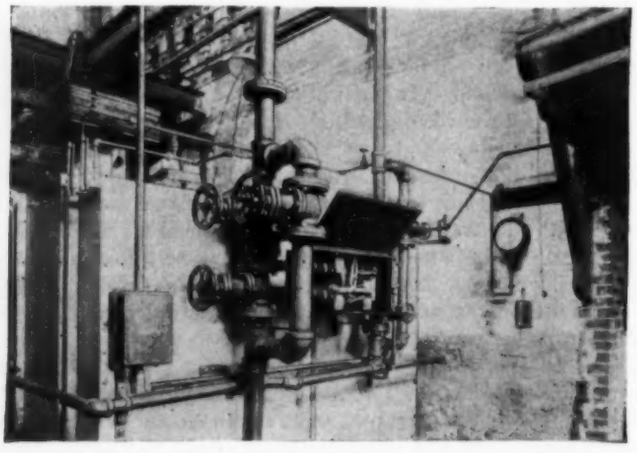
moisture. The boxes must be made of some material which is not attacked by the ammonia, or they will become brittle and fail in a very short time. The chrome-irons with 16 to 20 per cent chromium have proved very satisfactory.

The process is too new to say how long is required for nitriding a given depth of case. Some of the data given out state that a run of about 50 hours is required at present. Other data give longer and shorter periods of treatment from 20 to 90 hours. After the required length of time in the furnace, the boxes of material are removed from the furnace, and allowed to cool in still air to insure uniform results.

Any well-constructed gas or electric furnace can be modified for the process. Automatic controls are necessary but may be of commercial types. The low temperature of operation means a lower cost per hour than with the ordinary high-temperature heat-treating operations.

Properties Obtained

One of the fundamental troubles with ordinary heat-treating operations is distortion. This is fundamental because most steels undergo appreciable changes in volume in going through the critical points, both in heating and in cooling, and complicated sections are bound to distort. The nitriding process nearly eliminates distortion, because the steel is not heated to the critical



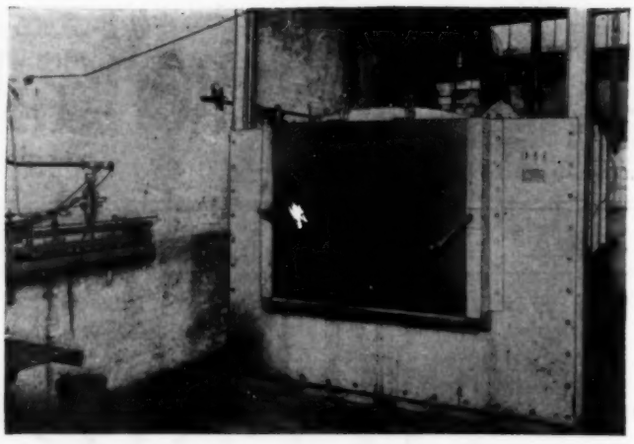
An automatic electric control attached to the gas and air valves keeps the furnace temperature within close limits

point during nitriding, the temperature recommended being less than 1,000 deg. Fahrenheit.

Of course, distortion will take place if the metal is not thoroughly annealed before nitriding. The nitriding process will not correct rolling, forging, or machining strains. An anneal at 1,000 deg. F. for about 5 hours is recommended prior to machining to secure good results. In some cases it will be necessary to subject the material to part or all of the following operations if the greatest degree of freedom from distortion is required:

1. Heat-treat to give the desired core properties
2. Rough machine
3. Normalize at same temperature used for drawing
4. Finish machine or grind
5. Nitride.

Scaling is also eliminated, because the scaling temperature is not reached, and because the ammonia atmosphere excludes oxygen. The surface has a gray

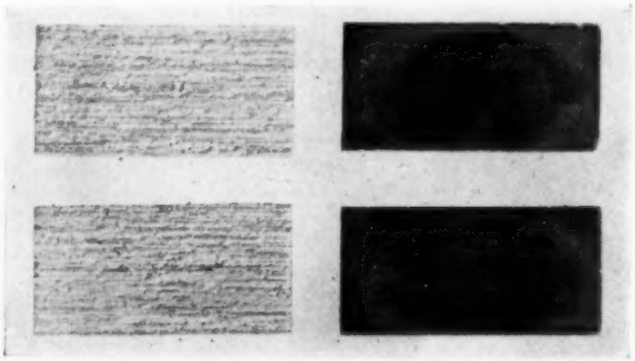


One of the gas-fired furnaces in which the gears are nitrided. The ammonia cylinders are visible over the top of the furnace, and the apparatus for testing the exit gas is at the left

color, similar to a carburized surface, which may be polished bright with emery if desired.

The outstanding properties of nitrided cases are extreme hardness and resistance to wear. At the same time, the core has toughness, strength, and impact resistance the equal of chrome-nickel and similar alloy steels. A case that will scratch glass, without having been quenched, seems rather spectacular, yet it is the property of nitrided Nitralloy. The best files are worn smooth without harming the surface of the steel. Furthermore, the case retains its hardness up to about 1,200 deg. F. This is a very desirable property, and one heretofore unobtainable. Ordinary alloy steels lose their hardness very appreciably when heated above about 350 deg. F. In some tests on airplane valves there was no loss in hardness of the nitrided case after running the motors 100 hours at 1,400 deg. F., and only slight scaling appeared. At 1,200 deg. F. there was no loss in hardness, and no scale.

In a test on an automobile with half of its piston rings of ordinary materials and the other half nitrided, at the end of 150,000 miles the ordinary rings were worn half away and the nitrided rings showed a loss of only 2 per cent. In another test in which test blocks were slid over each other, dry, in a wear testing machine, the nitrided blocks showed only 0.0005-in. wear after 100,000 strokes, whereas stainless-steel heat-treated blocks were severely abraded after 4,000 strokes.



The heat-treated stainless steel test blocks on the left were severely abraded after being slid over each other dry for 4,000 strokes, whereas the nitrided test blocks on the right showed only 0.0005-in. wear after 100,000 strokes under the same conditions

Such wear resistance as this means fewer shut-downs for repairs and replacements. In the neighborhood of 750 to 900 deg. F. the wear is not even so great as at ordinary temperatures, as the coefficient of friction is reduced. The nitrided case is classified with the stainless steel type of alloy in resistance to corrosion by fresh or salt water, and by moist air. In other words, it belongs in the rustless class of materials. The two materials mentioned differ in that the rustlessness of stainless steel is obtained by the use of large percentages of alloying elements such as chromium and nickel, while the rustlessness of Nitralloy is obtained in the hardening process. Nitralloy is not rustless in the unnitrided condition. Nitrided parts do not suffer from spalling or exfoliation as so frequently occurs in parts which are poorly carburized. The coefficient of expansion of the Nitralloy core is substantially the same as that for its case after nitriding, and as the common alloy steels.

Recommended Physical Properties

Tensile strength, lb. per sq.in.	100,000
Yield point, lb. per sq.in.	85,000
Elongation in 2 in., per cent	25
Reduction of area, per cent	50
Charpy impact value, ft. lb.	50

The tensile strength of the core may vary between 100,000 and 175,000 lb. per sq.in. depending on the drawing temperature. It is recommended, however, that in order to have great combined strength and toughness in the steel, it be heat-treated for the physical properties given in the accompanying table.

Suiting the Ideal Shop Organization to Practical Conditions

By Our Paris Correspondent

MONSIEUR E. BAUMANN, manager of the Sulzer plant at Winterthur, Switzerland, has contributed the following observations to the International Labor Bureau at Geneva as affecting present-day production in the metal fabricating industries.

> The volume of business possible depends upon the number of orders to be had and the time allowed for filling them. The whole depends upon the facilities and capacity for production of the undertaking which has the work in hand.

Up to this point we may say this is mere platitude. But he goes on to say that orders produced under ideal conditions would be work completed by the employment of a full staff of workers and full plant capacity for "normal working hours." He states that in practice this ideal is seldom achieved except in rare cases of mass-production factories, citing the automobile industry in particular as most nearly filling these conditions. It can never be accomplished in factories that work "on order," as do most engineering plants. For the latter it is a matter of adjusting working conditions to the work in hand, be the volume great or small.

Purchasers may ask certain precise delivery dates as a condition for placing their orders, and promises in this respect ought to be kept with equal precision. Variation in the bulk of orders in hand involves a considerable fluctuation in the application of the various working elements needed in producing these elements, and an effort should be made to diminish these fluctuations of workers and other plant capacities. One plan is to manufacture for stock, which, however, involves many risks in most engineering lines and can be only limited, to say nothing of the additional costs involved in carrying expensive stocks of heavy machinery which may wait long for orders to come forth, and again may become obsolete in certain respects before the stocks are actually absorbed by consumers.

Three other possible solutions exist. Enlargement of the plant and increase of the working staff; the plan of working two or three shifts; the prolongation of hours of labor of those workers most necessary for rapid output.

The first method calls for time, prudence and a financial resource perhaps beyond the limits for which the organization has ordinarily provided. An enlarged plant, brought into being at a time of high-pressure buying, involves the risk of a change of attitude, temporary or otherwise, necessitating greatly increased carrying charges for a volume of business which may not at all times hold up to the level of the new plant capacity.

The multiple-shift system also involves difficulties, due to the availability of labor and its living conditions which are not always in the immediate neighborhood of the plant and transportation facilities for bringing them to work may not exist at unconventional hours. It is claimed (in Switzerland at any rate) that workers have been known to throw up their employment rather than work at inconvenient hours.

The third solution of extending the hours of labor is often the only possible one. It is furthermore in the best interest of the workers themselves, inasmuch as, if prolonged hours of work of a special group are not carried out, still other groups may perforce have to work on reduced time.

Mr. Baumann's idea is that the regulation of working hours in Switzerland is too rigid, and that not enough consideration is given to the practical requirements of certain industries. He approves, apparently, of the more elastic regime in force in certain other countries and demands for Swiss manufacturers greater freedom in the application of working hours. He believes that the amount of overtime actually worked is greatly exaggerated. In 1927 the Sulzer plant had an average working week of rather less than 45 hours per employee. This figure was arrived at by taking into account all lost time for sickness, accidents, military service, holidays, etc., and all overtime. The average number of hours worked in excess of 48 per week was 86 per worker per year, or about 1½ hours per week.

At the fall meeting of the A.S.S.T., it was suggested that there is an important field for a series of chromium-copper steels with chromium content below about 3½ per cent. Such a series would lie between the plain copper-bearing steels and stainless steels, and would fill a gap in rust-resisting ferrous materials which is not now occupied. This intermediate position could be obtained at a very low cost because of the small amount of chromium present. Tests show that the proposed alloys have very good physical properties.

Day Work or Piece Work?

A NEW production man in the local loom company had been upsetting a lot of ideas that had held sway for many years. So manager Brown invited a few old cronies to lunch at the Business Men's Club, and also asked our counsellor, Bill Holland, to sit in—or eat in—at the same time. After the lunch was over and the new man, Harper, had been introduced, Brown started the rumpus by asking everyone—"What do you know about piece work as compared to a day wage?"

"Isn't any question about that, Brown. We proved years ago that piece work was the only way to get real production," said Plunkett of the Plow Company.

"We use a bonus system that works out fine," spoke up Francis of the Pump Works. "You never get anywhere on day work. Men loaf on the job, but a bonus puts them on their toes all the time. No really big concern thinks of day work any more."

There were several other similar outbursts, and then Brown turned to Harper with the remark, "Harper here doesn't agree with you at all. He sprung a new one on me awhile ago. And the worst of it is he seems to have a lot of ammunition on his side of the argument. He says that there's something wrong with the management when piece work gets more production than day work."

"Why, we increased our output fifty per cent after we put in piece work," sputtered Plunkett. "The men make more money, and they aren't all the time asking for a raise either."

"Same way with us," said Francis. "Of course, we think bonus is better than straight piece work, but we've had results similar to Plunkett's. Couldn't get anywhere at all with day work on mass production. Nobody can."

"I'll have to disagree with you both," said Harper. "Some big shops find straight day work pays. Ford's isn't exactly a small plant, yet he doesn't use anything but day work. And he gets results. I'm betting he gets better results than he would with piece work, because his men have no fear of a cut in piece prices. You gentlemen are probably getting more output per man than you did on day work. But you'd get a lot more if your men really *dared* to work as they do in Ford's, or similar daywork shops.

"What do you mean *'dared?'* " spoke up Plunkett. "We don't cut rates unless we change the method, and —"

"Old stuff, Mr. Plunkett. But you change the method every time a man shows he can earn what you call 'too much.' One of your own men told me, only last week, that his department could get out twenty-five per cent more work if the men didn't know from experience that it meant a cut in rates. Every new man asks how much he dares to earn, in every piece-work shop, and he's pretty careful not to go above it if he values his job. So you see that piece work can, and does, actually keep production down instead of boosting it, as you suppose."

"I can't believe that, Harper," sputtered Francis. "We've got good men, and they wouldn't soldier on the job. That wouldn't be fair to us."

"Wouldn't it be just as fair as your cutting their rates? Why should a man make himself more work for the same money?"

"What about it, Holland?" asked Brown. "Is Harper crazy, or has he got the right dope?"

"It seems to me," said Bill Holland, "that you've overlooked one thing that Brown quoted Harper as saying. He said 'there's something wrong with management when piece work gets more production than day work.' He's shown pretty clearly that piece work, or bonus, doesn't always get the most out of machines—that there is almost sure to be a conflict over rates when a man earns more than management thinks he should get. If this is true, then Harper has an argument. But I don't believe he's told us his whole story."

"I suppose you'd let the men come in as they pleased and work as they felt like it, eh, Harper?" spoke up Plunkett again.

EXECUTIVE FORUM

"That's just what I wouldn't do, Mr. Plunkett. But it's what you are doing now so far as the work is concerned. They don't feel like getting out all the work the machine will stand because they fear a rate cut.

"That's what I meant by management, Mr. Holland. Ford doesn't let each man set his own pace—conveyors do it for him. The conveyors are timed to give the highest production from the average man. There the management sets the pace. In Mr. Plunkett's shop the men set the pace, and set it low enough so that he will not think they are earning too much and cut the rates."

"But I couldn't pay them as much for day work as I do now," insisted Plunkett, turning to Holland.

"You seem a bit excited today, Plunkett," said Bill. "You forget that what interests you is the cost per unit of product, regardless of whether you use piece work or day work. If you can get more out of your machine equipment than you do now, you can afford to pay more money, even if it's day work. But you want to be sure you're getting out more work."

"Then you think Harper isn't so crazy as he sounds, Bill?" asked Brown.

"Harper has given us all something to think about, Brown. But it won't do to go off half-cocked and chuck out piece work without having a definite check on output. Piece work will probably increase production in most shops—at first. On the other hand, there's no doubt about the tendency of the men to play safe in piece-work shops. To get the most out of equipment and men, we've got to make it safe and comfortable, for men to have a high batting average."

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

Paying for Special Designs

Although it is common practice to use the design submitted by one bidder and let the work of construction to a competitor because the latter's price is lower, it is certainly poor business and against all principles of fair dealing.

The bidder whose design is acceptable, but whose price is too high, should be given an opportunity to revise his bid. If he still cannot meet the successful bidder's figure, the buyer or the low bidder should offer to pay the actual cost of making the drawings. The question is largely one of principle, for the expenditure involved in the production of a preliminary sketch submitted with a quotation is generally small as compared to the cost of the engineering and complete drawings necessary for the construction of the equipment.

The bidder submitting the accepted design has, in most cases, a right to prevent the use of it. But he should be willing to grant permission, especially if he is reimbursed for the expense of making the sketches. —M. GLICKMAN.

Discontinuing Old Models of Machines

When a customer insists on buying an inferior machine that apparently places him at a disadvantage, it is evidence that he does not thoroughly understand the advantages of the new model, or that there is something about the new model that does not meet his requirements. The price may be higher and he cannot see where he has anything to gain, or he may not consider the new model as good as the old.

It is up to the manufacturer to gain the customers confidence and find out just what objections he has to the new model. The manufacturer cannot afford to discontinue an old model just because he can build a new one cheaper. He must build his machines to suit the needs of his customers, if he is to enjoy success. If he finds that the new model really is an advantage to his customers, it is up to him to sell them on the new idea.

Setting a date to discontinue taking orders for the old model may mean a greater loss to the manufacturer than continuing to build the old one at a smaller profit. The better plan would be to continue taking orders for the old until they come in so slow that he can afford to turn them down. —W. J. OWENS.

Paying for Advice

The situation is fully covered by Mr. Hudson's remark, "I find it is customary for all architects to charge for advice." Under existing conditions in the machinery trade at large, Winters is correct when he says, "I want someone else to try it first." The result is, there is a program of watchful waiting and nobody doing anything.

It appears to me that the best way to handle such a problem would be for the machinery builders to band together, and set up a code of ethics covering desirable and undesirable practices, and stick to it, as the architects do. Just as long as human nature is what it is, unfair conditions will have to be fought.

—P. W. LAMSON.

Heat-Treating at the Reo Plant

Photographs by courtesy of the Reo Motor Car Company

Fig. 1—Parts to be carburized are transported to the basement of the heat-treating department and packed in alloy boxes of suitable sizes and shapes. After they are packed they are elevated to the floor above and delivered at the carburizing furnaces

Fig. 2—An electric truck of the elevating type is used. It is provided with an extension arm that permits it to be utilized for charging the furnaces. There are twelve oil-fired furnaces of the box type. The temperature ranges from 1,650 to 1,700 deg. F., and the work remains in the furnace from 9 to 16 hours, depending upon the depth of carbon case required

Fig. 3—The furnaces are controlled automatically within close limits, insuring uniform results. Automatic temperature recorders, one for each furnace, are located on a balcony at one end of the department, for checking and record purposes

Fig. 4—Upon removal from the furnaces the boxes are placed upon a revolving cooling rack. This rack is motor driven, and the loading and unloading are done at one location. Before the boxes are dumped, test bars are taken from each, and broken to determine the carbon depth

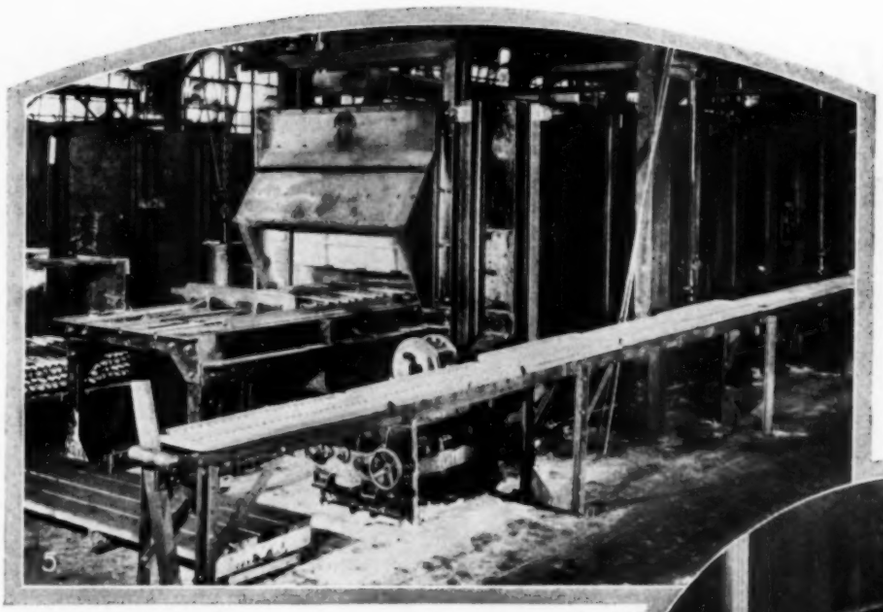
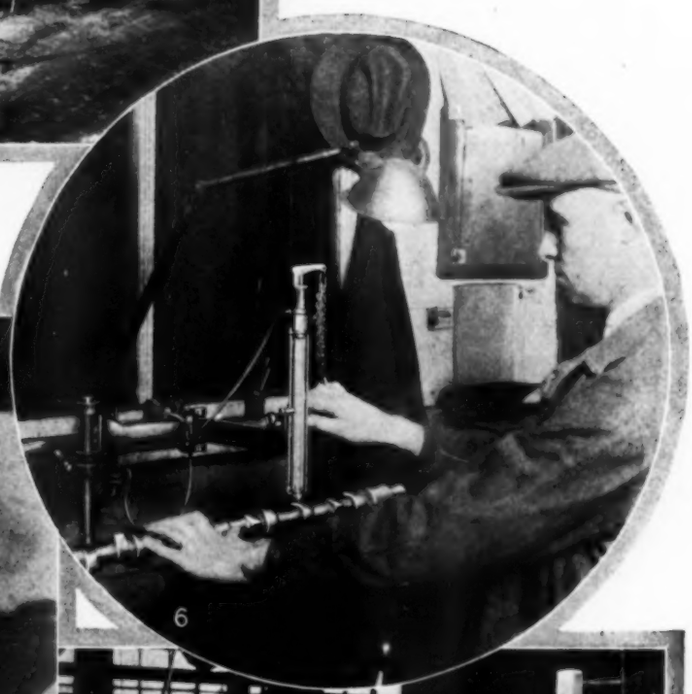


Fig. 5—After the boxes have been dumped, the parts are reheated in continuous type furnaces and quenched in oil or water as called for by the specifications. They are then tempered, cleaned, and the surfaces to be tested for hardness are buffed to get under the scale



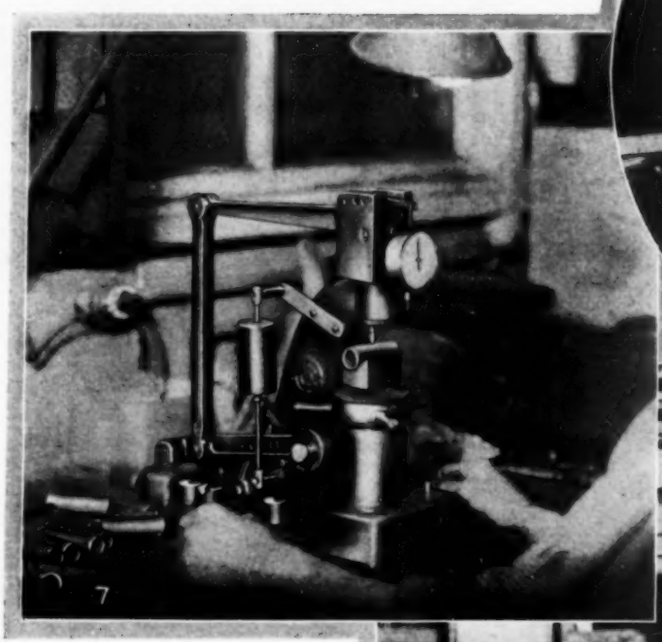


Fig. 6—Each part is tested with the apparatus best suited to its form and weight. Large parts, such as cam shafts and ring gears are tested for uniformity of hardness, the Scleroscope being used at several points in their surface

Fig. 7 — The Rockwell hardness tester is used on piston pins, hardened bolts and miscellaneous parts. The practice at this plant is to test each piece hardened

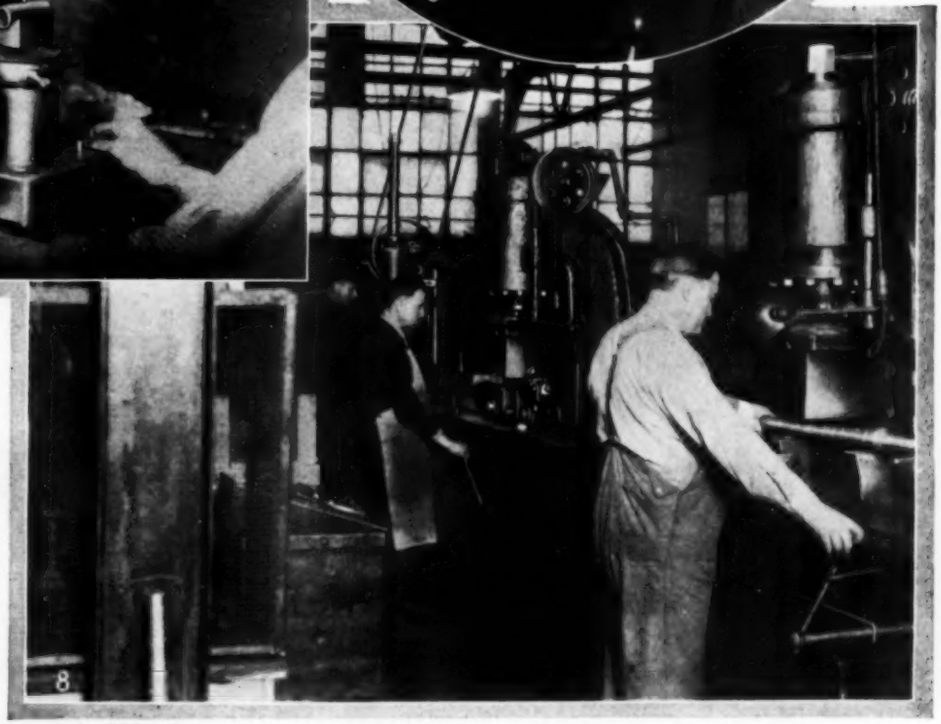


Fig. 8—Drive shafts, and cam-shafts and similar long parts are inspected for straightness. Those that show any warping are straightened under hydraulic presses. Some of the smaller parts are straightened in power presses

Airplane Welding Fixtures

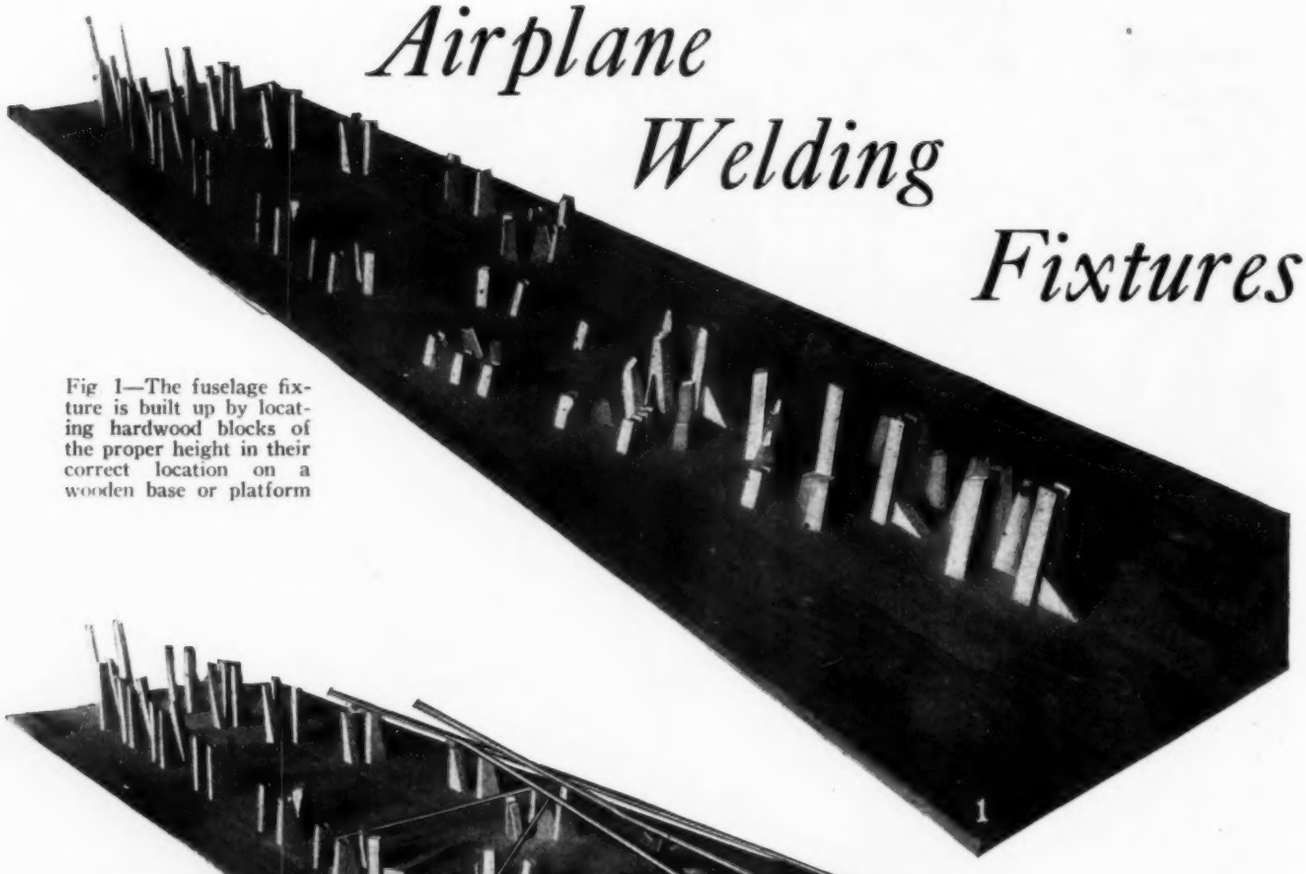


Fig. 1—The fuselage fixture is built up by locating hardwood blocks of the proper height in their correct location on a wooden base or platform

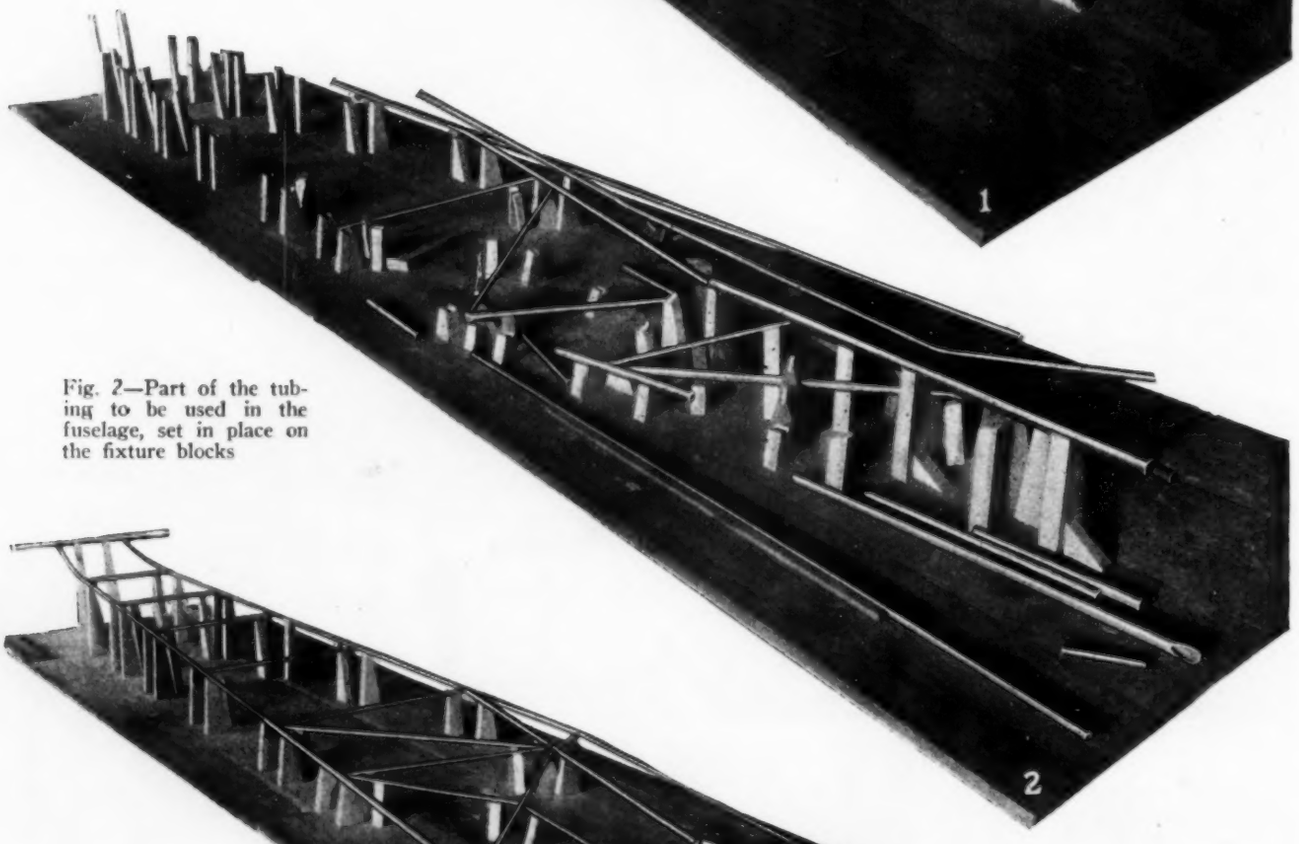


Fig. 2—Part of the tubing to be used in the fuselage, set in place on the fixture blocks

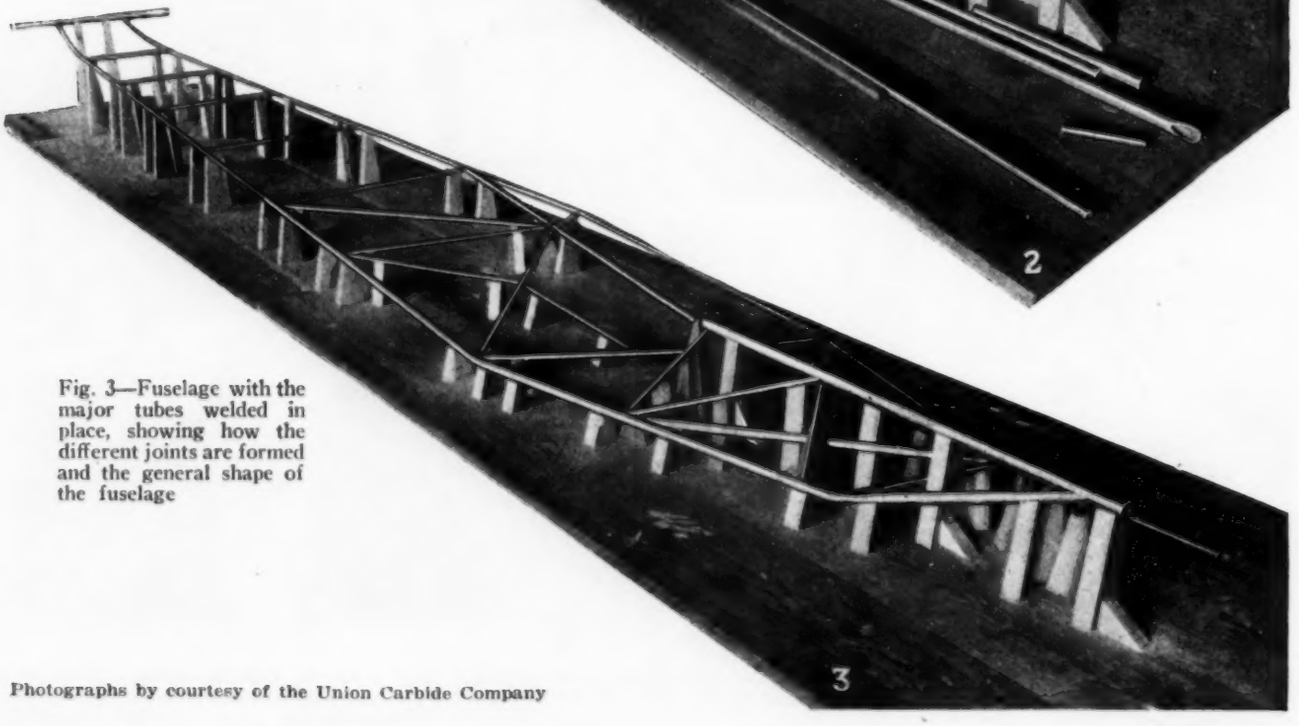


Fig. 3—Fuselage with the major tubes welded in place, showing how the different joints are formed and the general shape of the fuselage

Photographs by courtesy of the Union Carbide Company

The French Empire of Trade

Development of the French colonies means a greater market for our mining, road-building, agricultural and other types of machinery and equipment

By Dr. Julius Klein

Director, Bureau of Foreign and Domestic Commerce

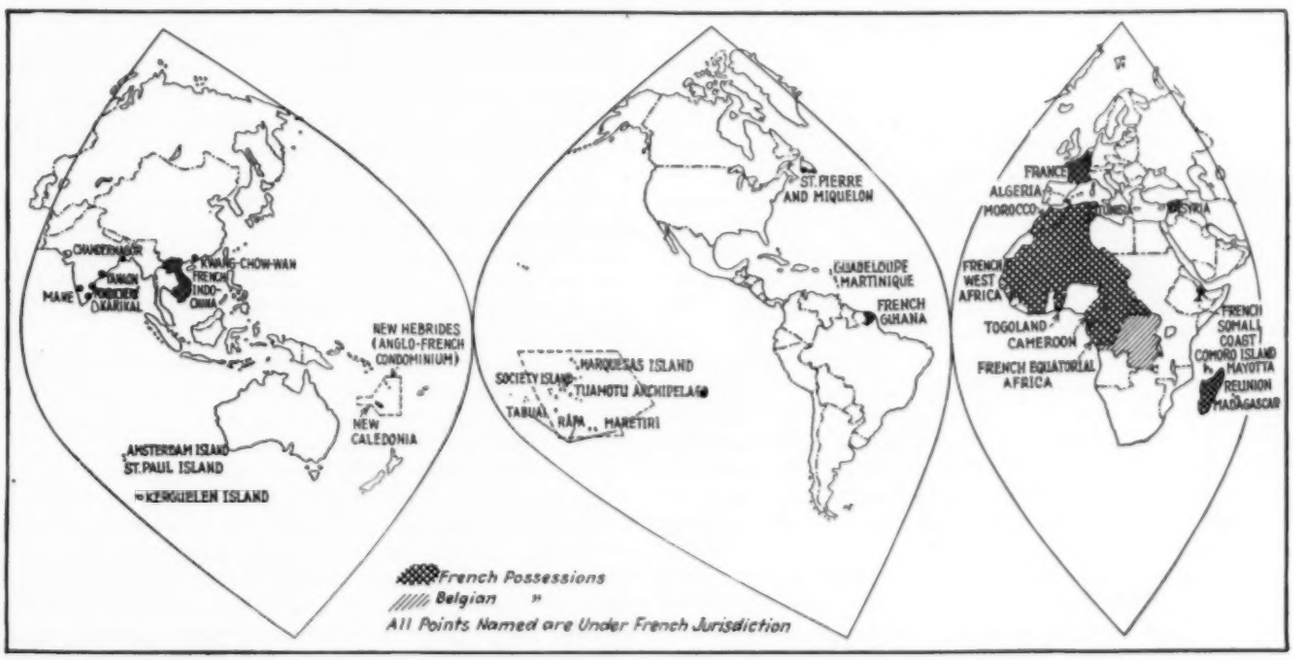
IT IS commonly observed in the realm of sport that "they never come back"—that the ex-champions are rare indeed who return to their old positions. If applied to the broad field of the history of nations, this adage would offer scant encouragement to those who feel that the days of a powerful France did not end on the field of Waterloo.

It is conceded that the French holdings of today are scattered far and wide, that on the map they present a considerable spread of territory. But this does not necessarily mean a comparable development of actual power. After all, are not the vast stretches of the Sahara a meager replacement for the densely populated industrial centers of the old continental empire of a little over a century ago? What, then, is the actual economic significance of this new empire which is being so vigorously exploited? What is its meaning to France, and to the position of the United States, in international economic affairs? Is it simply a costly, fruitless effort to revive the old glories, or is there a sound basis of economic significance which should be closely observed by American industry and commerce?

From our point of view, the development has three angles of interest: First, new markets for American goods in the colonies; second, sources of needed raw materials; and third, possible competitive drives by French trade using their own colonial outposts as bases.

Trade of today simply cannot be along the lines of the old leisurely operations. Much of it is involved in the celerity of replacement of parts. This simply means the projection of the fundamental American commercial policy of "service" into the trading operations of the world. Replacement means standardization. It means accessibility of stocks of supplies. It means, above all things, a readiness, indeed an eagerness, to back up the first transaction with solicitous concern for future relations between the two parties involved. All of which brings out clearly the value of widely scattered bases of operation around the world.

The dawn of the new day of international aeronautics is at hand. The possession of well-placed landing and fueling stations is an advantage of unquestioned power. It is true that it may be many years before aviation becomes practicable for the transportation of freight or even of express goods, but it is immediately potent in the swift transmission of the documents of commerce, and therein it renders today a service which runs into millions. In the field of more remote commerce, let us say that between Europe and South Africa, Australasia, or South America, the possession of these stations for airplanes is likely to be a factor of prime importance in determining the direction of foreign trade.



Widely scattered territories, mandates, and protectorates give French trade a decided advantage over our exporters in drives for the trade of several parts of the world. Belgian Congo and Belgium, with whom France has very friendly trade relations, are important neighbors of France in Africa and Europe. The feature of the above map whereby all areas are shown in their correct proportions was designed by the Coast and Geodetic Survey of the United States Department of Commerce for scale maps

Applying these observations to the French situation, we observe immediately a number of significant points. The inauguration last spring of a fast Paris-to-Buenos Aires ship-and-plane service brings those two capitals within eight days of each other, which is about a third of the time required in ordinary steamer traffic. This service was not developed simply as a fantastic stunt. It rose quite logically as a projection of the French colonial drive across the westward lobe of Africa.

And so, in this new "commercial-imperial" drive of France, she is using the air service across her African possessions to Dakar, the westernmost continental tip of the Old World, as the jumping-off point across the 1,863 miles of water to Fernando Noronha, the island outpost of Brazil. The inauguration of this service on a fairly regular schedule vividly typifies the awakening interest of France in Latin America. It is an interest by no means confined to the old tie of a common Latin culture, the lure of Paris, and the heritage of a common linguistic and legal tradition. In some respects the French have fallen heir to parts of Germany's shattered trade in the various southern markets of the world.

Now the world's leading exporter of iron and steel, and possessing among the best of potential rubber territories as well as potential sources of numerous minerals, the French empire is certain to be an increasingly important source of raw materials for most industries

France was long regarded as primarily agricultural. Indeed, it is still the first wheat producer in Europe, exclusive of Russia. But, with the acquisition of valuable iron, steel and potash resources through the transfers of land effected by the Treaty of Versailles, and with the expansion of her holdings overseas, we find an entirely new spirit permeating French commercial effort. Her share of the world's total exports rose from 6.7 per cent just before the war to 6.8 per cent in 1927. Meanwhile, England's fell from 15.4 to 12.8, and Germany's from 11.4 to 7.7 per cent. French exports have increased nearly two-thirds in value since 1913, which is a better record than that of any nation of commercial consequence in Europe.

Closely affiliated with this trade drive has, of course, been the impressive increase in her merchant marine, which likewise has grown more rapidly than that of any other merchant fleet in Europe. It has risen from 1.9 million gross tons in 1910 to 3.5 million in 1927. This puts it practically on a parity with the German fleet, though the latter is growing so rapidly that probably it will surpass the French in 1929.

Incidentally, one important aspect of this growth has been her increasing sales to the United States, which have risen 73.1 per cent since 1913 as compared with an increase of 62.4 per cent in her exports to her other markets. The rising prosperity level of this country with consequent increasing demand for French luxury and semi-luxury goods would therefore seem to have played an important part in the new commercial advancement of France. The notion that our markets have been largely debarred to her merchants either through the development of competing industries here, or through tariff discriminations, is not well founded. Indeed, we are today taking a larger percentage of French exports (6.3 per cent in 1928, according to preliminary estimates) than we did before the war (6.1 per cent in 1913).

Our *share* in the total of French exports is increasing more rapidly than the portion of the rest of the world, which would indicate that, as fast as French industry and commerce as a whole advance, we are likely to see a growth of her sales to the United States.

The important thing, however, in judging our economic relations with France is the extraordinary significance of the "invisible" item of tourists' expenditures. This item added from 250 to 300 million dollars in 1928 to the credit of France in the interchanges between the two nations. It is important to note that this represents transactions at retail, which pay profits that are often two, even three times those in the exports of goods declared in custom transactions. Consequently, the tourist purchases just mentioned are the equivalent in actual yield to France of more than double a comparable quantity of exports of French goods to the United States. The lack of a permanent commercial treaty between the two countries has fomented considerable acrimonious discussion between their respective merchant communities, and naturally these differences are likely to reflect upon the trade development of the colonial markets in their relation to American commerce. Merchants in each country have protested against the administration of the custom laws of the other. Particularly with reference to the increasing interest of American exporters in the French colonial trade, it has been alleged that the French requirement that all goods destined for the colonies must move either through a French port, or directly to the colonies, works a decided hardship upon the prospects for American concerns, since many of these markets, it is said, can be more effectively served through a third country or colony.

This controversy has brought out the contrast between the commercial policy enunciated by our Government, which is based upon complete equality of treatment of our trade with all countries, whereas the French policy is centered about the so-called "tarif de combat." As the name implies, this is a device for the favoring of the commerce of certain nations with France as against that of others, with a view toward bringing about certain changes in the commercial policy of the nation whose trade has been discriminated against.

One phase of the French colonial development which may require careful attention on the part of our importers is the matter of Governmental control of raw materials. Thus far the French have been involved in this situation only with respect to potash. There have been no colonial manifestations of this type of operation on the part of the French Government, though such developments would not be improbable in view of the necessarily intimate part which the French Government must play in the control and exploitation of these newly developed areas.

The extent of the French empire is not usually ap-

preciated by Americans. Exclusive of mandated Syria, it comprises 4.6 million square miles, which is over half again as large as our 48 states. Much of this area is made up of sandy desert or patches of Far Eastern tropical forest land. But, there have been some significant mineral developments on the northern and southern fringes of the Sahara in recent years; French Indo-China is potentially one of the best producers of rubber in the world; the steady flow of American capital to South America has aroused increasing curiosity in such hitherto dreaded places as French Guiana; and the last remaining island crumbs of the once great French Empire of North America, from St. Pierre and Miquelon in the north to Guadalupe and Martinique in the south, have taken on new significance as inter-American air routes are being laid out. Quite evidently there are other aspects to be considered in this problem of colonial aggrandizement than the mere question of immediately exploitable buying power. The population of the empire, exclusive of the mother country, is about 60 million, with a little over a third of that number in Indo-China. West Africa has about 13.5 million, Algiers about 6, Morocco 4, Madagascar 3.6, Syria, Tunisia, and Camaroon each about two. There are less than half a million in the colonial remnants in the New World, including the islands and Guiana.

The lack of a permanent commercial treaty between France and the United States, the French policy of using the tariff as a trade weapon, and the French policy of governmental control of raw materials, are among the points that require attention from American business leaders

It would be reasonable to expect France to make every possible effort to retain the maximum proportion of the colonial trade for herself. The various devices adopted, however, have not been sufficient to give her an overwhelming predominance in any save the nearest North African markets. The latter draw nearly three-fourths of their total imports from the mother country across the Mediterranean, but it is quite safe to assume that even that portion includes a considerable quantity of foreign goods reassembled or slightly reprocessed in transit through France. Clearly, the North African empire is the trial ground for French overseas colonial trade, and many French houses use it as a basis of experimentation as to the acceptability of their wares and trading methods for further exploitation in more distant colonies.

In the latter, the French ascendancy is far less marked. The mother country supplies only about 37 per cent of the total import trade of the colonies in Central and West Africa, Madagascar, and America.

As to the significance of the colonial outlet in the total French export trade, in 1928 nearly 16 per cent of the total French exports went to the colonies, as compared with less than 13 per cent just before the war. The value of these exports in 1928 ran well over 300 million dollars. Imports from the colonies to France for 1928 approached 200 millions, which represents more than 12.5 per cent of the total.

The real significance of these figures is in connection with the crucial factor of the balance of French trade. In 1928 that balance was "unfavorable" to France, that is, there was a net excess of imports over exports, a situation which is viewed with no little concern by those in charge of the Nation's fiscal affairs. But, had it not been for this substantial excess of exports over imports in the colonial trade, the unfavorable margin would have been far larger. In other words, the colonial commerce is being regarded as a vital element in stabilizing the whole commercial relationship of the mother country to the outside world.

Concern over the balance of trade accounts for the strenuous, indeed at times almost desperate, efforts now being made by the French Government to encourage the exploitation of the colonies. It accounts also in part for the vigorous efforts being made to encourage tourist traffic, especially to North Africa. The progress of this North African tourist movement is by no means a source of anxiety to American business interests; in fact, quite the reverse. The development of such a bond of active contact between the United States and those awakening regions is bound to result in an expanding interest in that territory on the part of our business leaders, and in a consequent direct encouragement of trade in both directions in many important articles.

Algeria takes about 44 per cent of the total French export trade to the colonies, or over $130,000,000 worth, which is logical in view of the proximity and the long-standing cultivation of that particular market. Her two neighbors on either side, Morocco and Tunisia, account for 41 and 27 million dollars, respectively. French Indo-China takes about 35, and West Africa about 24 millions.

France is today the world's leading exporter of iron and steel, with a total of nearly 6 million tons in 1927, as compared with 2,183,000 tons for the United States, 4,200,000 for the United Kingdom, and 4,531,000 for Germany. French output of steel ingots and castings has nearly doubled, having risen from 4.6 million long tons in 1913 to 8.1 in 1927. During the same interval Germany has declined from 18.6 to 16 million, and British output has risen only from 7.6 to 8.9 million.

The French colonial program is being developed on broad lines laying a foundation for a future structure, rather than with the intensive exploitation of immediate sales opportunities. To that end a major portion of her official colonial undertakings is in the shape of highway, railway, and port-work construction. A typical instance of this program is the expansion of the railway network, in Northern and West Africa, which is going forward steadily year by year in accordance with a carefully planned program and is opening up new resources and markets.

As for the significance of the markets of the French colonies from the point of view of American trade, they have, of course, as yet assumed only a very moderate part in our export operations. In 1913 they took about four millions of our total exports, whereas our sales to them in 1928 will probably prove to have exceeded twenty-one millions. This more than five-fold increase is a vivid indication of the growing buying power of the

colonies and also of our increasing interest in their development. According to present figures, our sales to the three colonies in North Africa will exceed twelve million dollars for the present year. Much of the trade for American goods with Indo-China and other Far Eastern possessions is by way of Manila and Hongkong and, therefore, does not figure in these direct export statistics. The same is true of the moderate import demands of the French West Indies, which are served to a considerable extent from Porto Rico.

The gratifying feature of the whole situation is the fact that we are today supplying a larger percentage of the total imports of each of the French colonies than was the case in 1913. This is quite understandable when one considers the new trend of demand in the colonies for equipment for mines, road building, opening up new agricultural areas, and other undertakings not unlike those which we encountered in the development of our own western and southwestern states.

Another aspect of interest in the situation is the possible application of American capital to these colonial enterprises. As yet there are no evidences of direct use of American funds in such undertakings. But there can be no doubt that at least a portion of the heavy advances of American capital to the mother country since the war has found its way to the colonies. One of the truly amazing aspects of the world-wide spread of American capital has been the growth of our holdings in France and French securities. These holdings have risen from 75 million dollars in 1913 to more than 650 million dollars in 1927.

French Colonies Furnish Us Raw Materials

A major aspect of American interest in the French colonies is in connection with the raw material situation. The widespread interest in this country in recent years in the various raw material controls adopted by foreign governments is an indicator of the increasing dependence of our industries upon overseas sources of essential supplies. With the chain of French colonies lying almost entirely in the tropics and comprising a wide range of terrain and productivity, we can expect a steadily increasing interest in their potentiality as sources of necessary materials.

Our direct imports from the colonies have increased from about two million dollars in 1913 to nearly ten million dollars in 1928 (exclusive of Syria, for which comparable pre-war figures are difficult to obtain). Chief among the items involved are carpet wool (3 million dollars), iron ore and concentrates (1.5 million), cork (1.5), and cabinet woods, palm oil, goat and kid skins, and olive oil from half a million to a million dollars each. These figures represent only direct shipments. There are, of course, quantities of other consignments, which come to us by way of France or other non-colonial members. Indeed, probably the major portion of our imports from the colonies move along such indirect routes. It would seem inevitable, however, as the trade increases that more of it should come along the most direct line, as has been the case with our commerce with the colonial possessions of other nations. As the standard of living and the industrial necessities of the United States continue to grow, we shall be requiring steadily increasing supplies of rubber, cacao, vegetable oils, coffee and spices, to say nothing of numerous minerals, all of which will be figuring in greater abundance among the products of the French colonies.

SEEN · AND · HEARD

By John R. Godfrey

The Mathematic Balancer—What is a slot?

SQUARE pegs and round holes have long been topics for moralizing and preachment of various sorts. But it is not always easy to know just which holes or pegs are square, or round.

One of my good friends tells me that the man who runs the crankshaft balancing machine in his shop is a wizard on figures. He figures out the stresses of unbalanced forces, makes his own charts and thoroughly enjoys his job. As the story goes, he is always ready to pause in his work to explain to any visitor, in detail, just how the machine works. And it is on his own time too, not the company's, as might be suspected. He is said to pass up several dollars a week in the pay envelope by the time he takes to show-off his balancing machine to admiring visitors.

A man with his capacity for figures would seem to be wasting his time on a job that can be handled by any fairly intelligent operator after a little practice. His mathematics are a pastime and not part of the job. So it would seem that this man, and the world, would be better off if he were on some job where his mathematics were needed. He seems to be a square peg in a round hole and by all the rules he should be unhappy and discontented at the lack of opportunity to utilize his talent.

But he isn't. He likes the job. So, is he out of place —or not?

* * * *

Nomenclature—or the names of things, to use more common language—is more important than many seem to believe. A case in point is the simple word "slot." Just what does a slot mean to you?

A recent advertisement referred to machining a slot in a gear—the slot in question being a reduction in diameter of a portion of the hub extending to one side of the gear. Others called it a groove, another a recess and one thought "annular groove" was right.

But annular refers to a ring and would seem to be a groove cut on a flat surface as by a trepanning tool. Recess is considered by many to mean an undercutting or enlarging of an opening below the surface, while some consider any depression below the main surface as a recess. Then, too, a groove is frequently straight, but it can be curved as in the oil passages cut in bearings. But how do slots and grooves differ, and how would "radial groove" describe the reduced hub diameter mentioned?

Recent tests at the Bureau of Standards employed a new method for judging the life of cutting tools when taking finishing cuts. The method depends upon the fact that when two tools are set at equal depths in the toolholder, the trailing or following tool will not cut while the leading tool shows no wear. In these tests, the trailing tool started cutting when the leading tool had worn about 0.002 in., and this point was taken as the point of failure of the leading tool.

Specification and Procurement
of Manufacturing Materials
Methods Employed at the Royal Typewriter Plant

By George S. Brady
Associate Editor, American Machinist

IN THE manufacture of a light, intricate machine, such as a typewriter, the relative cost of raw materials is not as large in proportion to the total cost as is the case in many machine tools and heavy machines. This is naturally due to the fact that the labor cost of making the small, intricate parts is high in proportion to the weight. But the fact remains that the aggregate costs of materials in typewriter and similar manufacture is exceedingly important. At the plant of the Royal Typewriter Company, Hartford, Conn., there is what amounts to a Materials Board, consisting of the factory superintendent, the mechanical superintendent, the purchasing agent, and a member of the engineering department. This board does not necessarily meet as such, and when once a machine model is in production so that changes in material are only occasional, the need for its joint action is rare. But on practically all questions relating to materials, the decision of each of these men is obtained by the engineering department. The factory manager is then the final authority on the approval or rejection as concerns manufacture. Where the change of material is important enough to affect sales arguments, the decision as worked out by the factory staff is submitted to the sales department in New York for its approval.

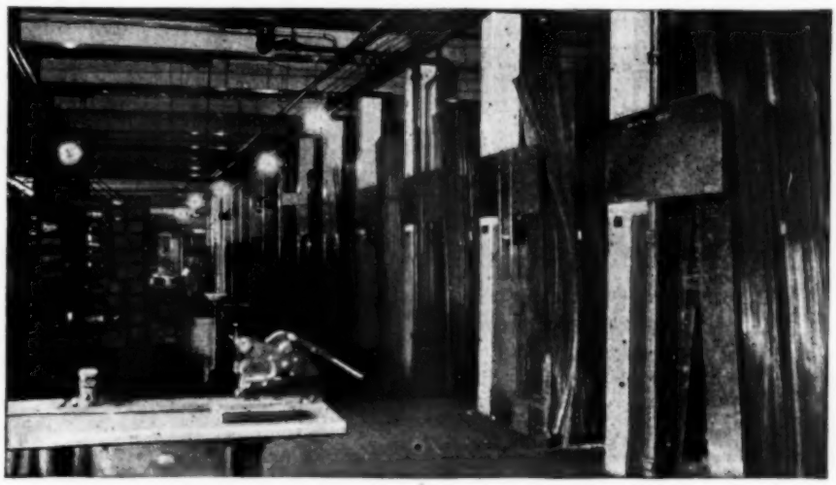


Fig. 1—Raw stock storeroom, showing method of storing rod stock upright to conserve space. An average of two months' supply of material is kept in storage, and a running inventory is maintained

Requests for changes in materials on standard models occasionally come from the field through the sales or service departments. Reports of failure in service are first investigated by the engineering department, and the model room is set to work on the problem. One failure may be due to faulty material, but persistent failures over a period of time may be traced to wrong design, wrong material, or improper heat-treatment. In the case of a bracket on which some breakage had been reported in service, the material was changed from cast iron to bronze, although this resulted in higher first cost and greater machining costs. After further investigation it was found possible to obtain suitable high-grade malleable iron castings that would meet all requirements of strength, and at a material and machining cost considerably lower than that for bronze. In another outstanding case it was found that the occasional failures of the parts were due to lack of uniformity in the hardening, and this was entirely corrected by installing a machine for treating the parts automatically. In the specification of material for parts for a new machine, previous experience of all of the staff is, of course, a highly important factor. Most of the key men on both the engineering and production staffs have been with the company since its inception, more than 20 years ago, and are familiar with the gradual changes that have been incorporated in the product of the company during that time. However, when new mechanisms or new machines are approved, full working models are built in the model room of the engineering department, and the "Board" determines the best available material for the parts. Models of the mechanism, built according to manufacturing standards, are put into machines and placed in regular service for a number of months for test before the material is finally approved for production. The design of parts to be blanked from sheet metal, and the punch press tools, are given careful consideration with the idea of getting the greatest number of parts possible out of a given quantity of steel. This has proven very valuable in minimizing the tonnage of skeleton scrap.

There are about 1,700 individual parts to a standard typewriter, many of which are used in more than one place. There are about 550 different items of raw materials kept in the raw stock storerooms, and another 250 items are purchased outside and kept either in a raw stock room or in the finished storeroom. The raw stock includes various sizes and qualities of brass, aluminum, steel, and nickel silver, while the purchased parts include

R. T. CO. INC. 6-21-28 FORM F-106-A

RAW SCREW STOCK RECORD

CLASS	SIZE	LIMITS	SPECIFICATIONS

TOTAL LBS. PER 4 MONTHS REQUIREMENTS AT MACH. PER WEEK=

ORDERED STOCK						ASSIGNED STOCK Assign Stock upon Receipt of Raw Stock Advance Notice from D-24.					UNASSIGNED STOCK DELIVERED			Stock on Hand Lbs.
On Order			In			Assigned			Delivery Completed					
Date	From	Lbs.	Date	From	Lbs.	Op. No.	Date	Lbs.	Date	Lbs.	Op. No.	Date	Lbs.	

2 THIS CARD MUST BE FILED WITH RAW STOCK SUMMARY CARD OF SAME STOCK

A running inventory is kept of all raw stock in storage on the form shown in Fig. 2. Filed with this card is also the one shown in Fig. 3, indicating to the storekeeper the different parts made from the material

R. T. CO., INC. FORM F-106A 8-10-28

RAW STOCK SUMMARY
SCREW STOCK, TUBING AND WIRE

CLASS	SIZE	LIMITS	SPECIFICATIONS

POUNDS PER FOOT

PART NO.	FEET PER 1000 PARTS	POUNDS PER 1000 PARTS	PARTS TO 1 MACHINE								POUNDS PER 1000 MACHINES							
			10"	12"	14"	18"	20"	24"	28"	30"	10"	12"	14"	18"	20"	24"	28"	30"

3 TOTAL WEIGHT 1000 MACHINES (USE PENCIL) 10" 12" 14" 18" 20" 24" 28" 30"

Fig. 4—Advance notice form sent to the stores department by the production department when a material is to be changed

Fig. 5—Report card returned by the storekeeper, giving status of the material on hand and ordered, so that parts in progress can be scheduled on time

R.T.CO.,INC. FORM F-228 8-29-28 5M

RAW STOCK ADVANCE NOTICE

DATE_____ AN ORDER IS TO BE ISSUED TO

DEPT._____ ON (DATE)_____ AS FOLLOWS—

ORDER NO._____ PART NAME_____

QUANTITY_____ STATUS OF THIS OPERATION IS_____

RAW STOCK DEPT TO FILL IN BELOW STOCK REQUIRED

_____ LBS. OF_____
SIZE & SPECIFICATIONS

DO NOT GIVE OUT ANY STOCK FOR PRODUCTION PURPOSES WITHOUT THIS NOTICE.

4 PRODUCTION DEPT., PER_____

R. T. CO., INC. FORM F-228A 8-30-28 5M

RAW STOCK ADVANCE NOTICE REPORT

DATE_____ AN ORDER IS TO BE ISSUED TO

DEPT._____ ON (DATE)_____ AS FOLLOWS—

ORDER NO._____ PART NAME_____

QUANTITY_____ STATUS OF THIS OPERATION IS_____

RAW STOCK DEPT TO REPORT BELOW CONDITION OF STOCK FOR THIS ORDER

5

R. T. CO. INC. FORM O 98 9-4-28 5M

PURCHASE REQUISITION

DATE_____

TO PURCHASING DEPARTMENT:

PLEASE ORDER THE FOLLOWING ARTICLES FOR DEPT._____

FROM_____

QUANTITY	DESCRIPTION

SIGNED_____
FOREMAN

7

R. T. CO., INC. FORM O. P. 49

MATERIAL REQUISITION

STOCK ROOM DEPT NO. DATE_____ 192

CHARGE ALL MATERIAL TO PART AND OP NO._____ DEPT NO._____

PART NO.	QUANTITY	DESCRIPTION	COST DEPT. RATE	COST DEPT. AMOUNT
		FOREMAN		

FOR RAW STOCK DEPT USE WHEN TRANSFERRING STOCK.

QUANTITY_____ LBS WEIGHED BY_____

STOCK SIZE_____ SPECIFICATIONS_____

_____ RECEIVED_____ FOREMAN

TRUCKMAN DELIVERING STOCK MUST HAVE THIS SLIP SIGNED AND RETURN IT TO DEPT. 11 OFFICE
DEPT. 11 TO POST FROM THIS SLIP AND SEND IT TO MAIN OFFICE THE DAY FOLLOWING DELIVERY

6

Fig. 6—Form used by the foremen for ordering direct material from the storeroom. Fig. 7—Form employed by the storekeeper for notifying the purchasing agent to order additional materials

castings, screws, rivets, glass panels, key glasses, molded products, decalcomanias, rubber, artificial leather, and veneer. The materials employed in manufacturing, such as drills, oils, waste, and abrasives, and certain other materials that are used in finishing the product, such as enamels, lacquers, and plating metals, are kept in a separate general storeroom.

In ordering steels from the mills, the specifications are usually limited to a designation of the tempers, the limits on the sizes, and to a description of the use for which the material is intended. No elaborate specifications, or close analyses, are given. The problem is put up to the mill to supply a steel that will accomplish the purpose. Usually, the contract with the mill covers a three months' supply. The price on each purchase order is regulated by the market price at the time, and the purchasing agent keeps in constant touch with general market conditions.

New sources of supply are constantly coming up, and firms offering new material are given an opportunity to submit the samples of materials and quote prices. This feature is not as outstanding as it is with plants manufacturing machine tools or special machinery, as the stresses and problems of wear are not as acute in a light mechanism such as a typewriter. For example, one grade of Bessemer stock has been found applicable to many of the round parts turned up in the screw machine, and as this is a standard material furnished by most of the mills, the problem of procurement is simple.

Castings Procured Outside

All castings are purchased from outside foundries. These include cast iron, bronze, aluminum, and malleable iron. The castings are required to be pickled and tumbled, and to be true to patterns in every respect. Castings are given 100 per cent inspection upon receipt in the stores department. Forgings are likewise trimmed and pickled by the supplier, and every piece inspected on receipt.

When the raw material is received at the plant, it is inspected in the raw stock department. On important materials a 100-per cent inspection is made, but in other cases, such as regular bar stock for screw machine parts, a sampling check is made on about 5 per cent of the bars taken from the bundles. The raw-stock inspection on strip steel consists in testing for size, and performing bending tests, also Scleroscope and Rockwell hardness readings are made on some items. In the case of certain highly important steels, a piece from every roll is bent in the press and given the regular heat-treatment. This is considered a surer test than reliance upon chemical analysis. No analyses are made in the plant, but where any controversy arises, a sample of the material under discussion is sent to an outside laboratory and an analysis is obtained. The best results have been obtained by co-operation with the mills, and by calling in the mill representatives when difficult situations arise.

The stores department keeps a running inventory of all stock on hand, and this stock is kept as low as possible consistent with the production schedule and certain manufacturing peculiarities. The average is less than two months. Under exceptionally favorable buying conditions, however, larger stocks may be ordered and stored, but in general it is considered desirable to work as close as possible. It is found to be less expensive and entirely practical to follow this system throughout, and to have several follow-up men to keep parts moving, rather than to tie up large amounts of material in excessive quantities of parts in process.

The raw stock running inventory card is shown in Fig. 2, and the summary card showing the different parts for which the stock is used, is illustrated in Fig. 3. Smaller cards, giving the specifications and uses of the material, are filed in the engineering department.

When a change in material has been approved, the engineering department sends to the production and purchasing departments a production limit note, and also a request for the immediate inventory of the raw material and manufactured parts on hand. Based on the status of the parts and the material on hand, according to this inventory, the engineering department then calculates the amount of the material that must be ordered, or remodeled if it can be reworked, to balance other parts in process. If material or parts are to be scrapped, the amount and value is sent to the factory manager and factory superintendent for decision whether or not to delay the change until these parts are consumed. Instructions are then issued to the production and manufacturing departments. Before issuing orders for a new or changed lot, the production department sends a "raw stock advance notice," shown in Fig. 4, and the storekeeper reports back the condition of his stock material on the form shown in Fig. 5. This enables the production department to schedule parts on time.

The foremen have authority to order materials from the storeroom after being notified by the production department to start a job, but it must be done on the standard material requisition shown in Fig. 6, indicating the part for which it is intended. When completely filled out, this requisition serves as the medium for computing the materials cost of the machines in production. A separate requisition is used by the foremen for ordering indirect supplies used in manufacture. The purchase requisitions used by the stores department are made out on the standard form shown in Fig. 7. These requisitions are usually based on shortages from minimums as determined by the storekeeper, and they are the authority for the purchasing agent to order material from the mill.

The disposal of scrap material is a function of the purchasing department, and is a considerable factor in lowering the net cost of production materials. The skeleton stock from the press department is made into compact rolls according to class and grade of metal. This baling is done on a special machine for the purpose. Other scrap materials are separated into the regular classifications of the scrap metal dealers, and sold to local dealers. It is not considered economical to attempt to accumulate large quantities nor to make the fine gradings that would be required in selling the scrap direct to the melters.

Materials and Production

With the decreased unit labor cost due to modern equipment and better shop methods, the relative unit cost of materials entering the product naturally increases. Increasing attention must therefore be given to better selection and economic handling of materials.

The foregoing fourth article on the Specification and Procurement of Engineering Materials describes the methods used for selecting and handling materials in a large small-parts production plant. In an early issue another article will tell the story for an average-sized miscellaneous machinery plant.

· THE · FOREMAN S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Helping the Tool Designer

"HAS the new tool designer been around to see you yet, Al? He came to see me this morning about a new fixture he wants to make for drilling those valve bodies." It was a snappy day, and the two foremen were out for a little fresh air after their noon lunch.

"Yes, Ed, I had a chat with him yesterday about some fixtures for my department. He seems O.K. to me, and knows a lot about machine work."

"Then why doesn't he design his fixtures without bothering me? I've got plenty to do without helping him out on his job."

"Grouchy again, Ed. You need more outdoor exercise. It seems to me he's a wise bird to get all the ideas he can from us in the shop."

"Of course it's a bit of a compliment I suppose, Al, to have one of the office bunch ask our advice. But I don't see why I should help him design fixtures. That's his job. Let him attend to it."

"And he's doing it, Ed. But it's up to us to help out with any good ideas we've learned on the job that will help out production. We know a lot more about this work than he can possibly know. The chances are we couldn't design fixtures as well as he, but we can help him by pointing out any little 'bugs' that might creep in, as they often do."

"I guess you're right, but I should think he'd sort of hate to have to ask advice from the men in the shop."

"You've got him wrong, Ed. He's a real guy, and he'd as soon get an idea from Dick the sweeper, as from anyone. He wants all the suggestions he can get, for the better the fixture the better he'll stand in with Williams. But I have a hunch that isn't all, Ed."

"What's your hunch, Al? You always did have a lively imagination."

"Well it's my idea that the new man knows fixtures a darned sight better than we do. Of course it's a good plan to see if we have any ideas and use 'em if we have. But there's more to it than that—and I'll hand it to him for being clever."

"As how, Al?"

"Don't you see, Ed. Besides consulting us and getting our good will and our ideas at the same time, he's making us a party to the design. If we suggest things and help him out we're putting our O.K. on it, and we can't kick if it isn't all it should be. The boy's clever. We've got to make the fixtures work if he uses our ideas in making them. And we'll do it, you bet."

Is Al right as to its being part of the foreman's job to help the tool designer? Or is Ed's objection valid? Has Al caught the real reason why the tool designer consults the foremen about new fixtures?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Reading the Shop Language

ONE large manufacturing concern has solved this problem by including blueprint reading as one of the dozen or more courses given after working hours to its employees. The course is largely attended, in spite of the fact that a fee is charged for its ten lessons. Its popularity is no doubt due to the fact that the workers realize and appreciate that the management is making an effort to provide them with a tool whereby they can become more valuable workers. —J. KOLLARIK.

MANY operators fail to read drawings correctly because they work to gages, and blueprints are not required. These operators lack the practice which machinists get. A short course of instruction in the reading of simple drawings, or a good explanation from the foreman or an experienced machinist, should enable the average operator to reach such drawings as he handles. In order that he may be kept in practice, it will be necessary to give him a blueprint on each job.
—W. E. WARNER, *England*.

Holding Back on Piecework

THERE is nothing unusual about Bill's experience. In some shops, if a man feels in good working shape on a particular day he tucks away some of the work for a rainy day. If he should turn in all his work he would simply experience another cut. After a man has experienced a number of cuts as a result of successive increases in efficiency, he soon discovers that the management does not propose to pay him more than a certain amount of money. Therefore, he will turn in enough work to secure a trifle less than the maximum amount he can secure without experiencing another cut. If he has any extra work finished, he will simply reserve it for future days. —EDWARD PIRANIAN.

Letting Good Men Get Away

WHEN it comes to promising or hinting at future possibilities for a particular individual, I'm inclined to agree with Ed's tactics. Men in the shop treasure up and hang onto personal talks with the foreman, and many times even hinted possibilities become definite promises as they are mulled over in the mechanic's mind.

To let a man know that he can hope to be advanced without a definite promise is not very hard. If you'll never play favorites, if you'll establish a reputation for square dealing and always pick the best man for the job, the men will know how they stand at any time. If your judgment is good, you'll find the men will try just as hard, and stick as well, without a promise, because they know among themselves just as well as you do who is earning the right to a raise. —JOHN W. KERN.

THE · NEXT · TOPIC

The Exit Interview

ADVANCE QUESTION

The "Exit Interview" is the latest piece of red tape started by the employment manager. Ed says it looks like putting a watch dog over the foreman, but Al thinks the plan has good points, as well. Would you like to have such a check-up on you when your men quit?

Making Foremen—or Importing Them

ORGANIZATIONS have only themselves to blame when they have to go outside for their executives, unless they are of such recent growth that they have not had time to develop their own men. No other individual action so strikes at the heart of an organization as promotion, and there are few things which will stir up discord more quickly than a careless selection of the individuals placed over the heads of more competent people.

When a man is trained in the work he is to do, he is in a better position to perform the work of the new position with competency. The delays and errors incident to entering on new work in a new organization are far greater than if the man were already familiar with its general routine. Moreover, a foreman imported from the outside will encounter more antagonism than one promoted from the ranks. The antagonism the outside foreman will encounter, from at least a part of the group, is something to be considered, and is bound to react unfavorably on his work. —C. GREENSTEIN.

Does Appearance in Tools Count?

SUCCESS in modern production methods is founded upon a careful analysis of requirements, so that all necessary utilitarian functions are taken care of, with all unnecessary refinements, which serve no useful purpose, eliminated. Appearance, though it is important in a tool which reaches the public, serves no useful function in a jig used in the manufacturer's plant. The important things in a jig are accuracy and permanency at minimum cost. Given these, appearance has no more effect on the resultant product than if all the men wore the same type and color of clothing to harmonize with the color of the shop walls. —JOHN B. FLOWERS.

Railroad Shop Methods at Moncton

By Fred H. Colvin
Editor, American Machinist

Included are planing tools and fixtures, special aligning fixtures, and devices that aid in reassembling locomotive parts

IN COMMON with other railroad shops, the Moncton shops of the Canadian National Railways are confronted with the problem of handling a large variety of work in comparatively small quantities. And, as in many other cases, numerous ingenious methods have been devised for handling such work easily and economically.

A method of planing a cylinder half-saddle is shown in Fig. 1, where the casting has first been planed on the center, or mating surface, and is then mounted on the planer table, being aligned and clamped as shown. In addition to the strap used in clamping the casting to the table, there is a brace for taking the end thrust.

The side head of the planer is used in machining the upper part of the saddle to the desired arc to receive the boiler. The feed screw is removed and an extension to the outer end of the tool head is pivoted to the pedestal shown. The radius of the arc planed depends on the distance between the point of the cutting tool and the center of the pin in the pedestal. Feed for the cutting tool is secured by the side-head vertical-feed screw moving the head on the ways of the housing. The tool head is free to slide in its saddle, owing to the removal of the feed screw, allowing the cutting tool to be fed through as much of the arc as is necessary to machine the saddle.

Another planing job is shown in Fig. 2, where switch plates for the maintenance of way department are being planed in quantities. The switch plates are clamped in lots of three, by heavy straps that bolt to the planer table and that also carry setscrews bearing directly on the plates under them. The main feature of this job, however, is in the double toolholder that carries two tools spaced far enough apart, in tandem, so that only one is at work on the same plate. By dividing the cut between

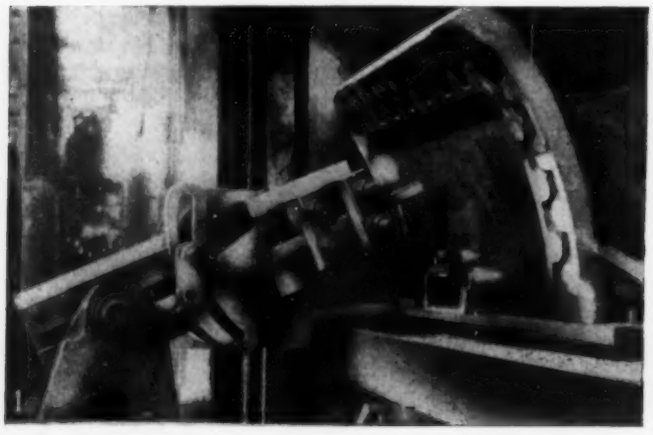


Fig. 1—Method of planing cylinder half-saddles. The feed screw is removed from one of the side heads, and the extension on the outer end is pivoted to the pedestal at the left. Feed is obtained by the vertical feed screw that operates the side head.

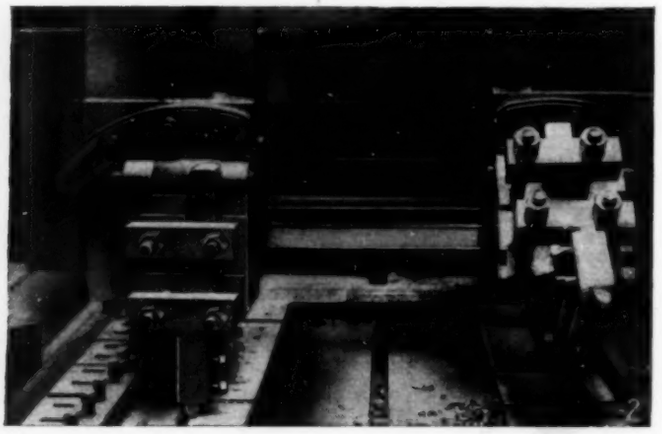


Fig. 2—Special double tool holder used in planing switch plates of various types. This view also shows the method of clamping the plates to the planer table

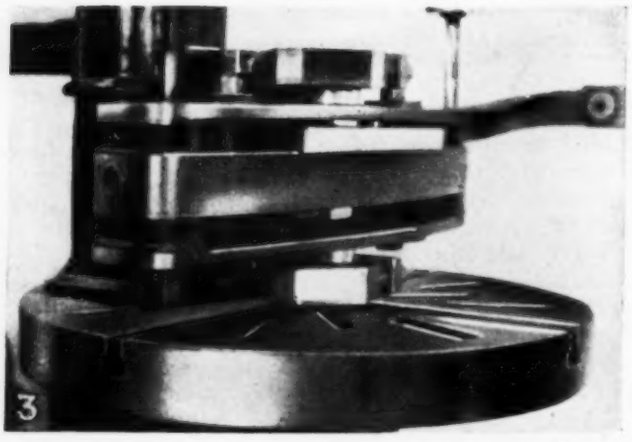


Fig. 3—Device for accurately centering the link. The link trunnions on each side are held in V-Blocks, while the link itself is centered with regard to the trunnions by an expanding device not visible in this illustration. The fixture also provides a positive means for accurately reaming the hole

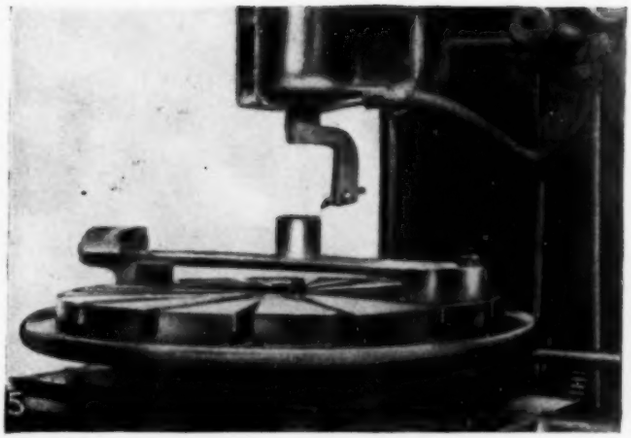
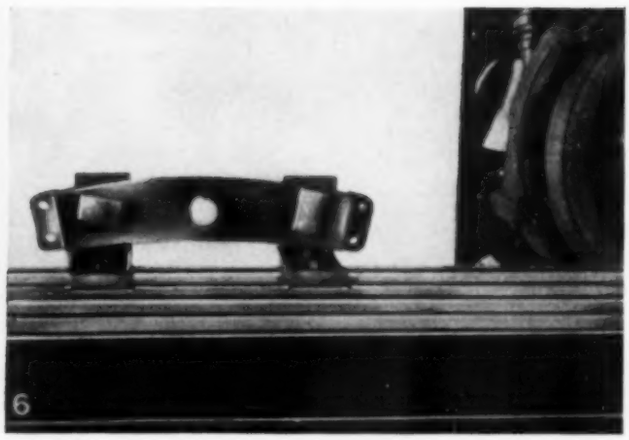


Fig. 5—Turning the trunnion of a link side-plate on a vertical milling machine. This is a case of utilizing the machine most available for handling a job that is awkward at best.



The method of turning is very similar to that used in finishing, or truing, crankpins in place. Fig. 6—Grinding the bearing-faces of the link side that carries the trunnion. The work is held by two substantial angle plates on the table of a face grinding machine, such as is used in finishing locomotive guides. A heavy-duty face grinder is used for the purpose

the two tools, a ready method is provided for planing work of this kind considerably faster than is usually the case.

For accurately centering the valve-motion link with the side plates that carry the trunnions by which it is suspended, the special centering device is used, as shown in Fig. 3. The centering device consists of a plate carrying two clamps that locate the trunnions by the V-blocks at the top and bottom. In addition, the plate also carries an expanding device that centers the link with relation to the trunnions, as shown in detail in Fig. 4. After the link and the side plates

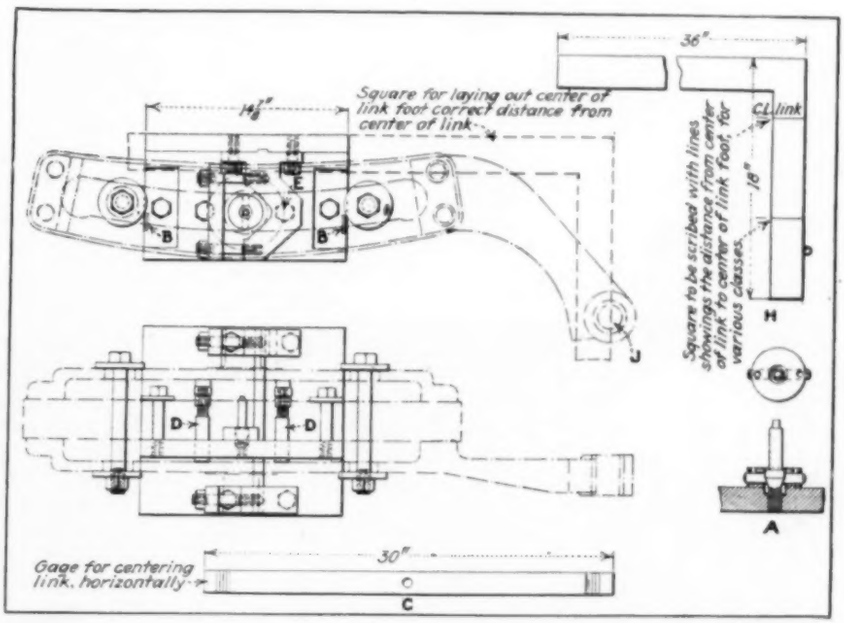
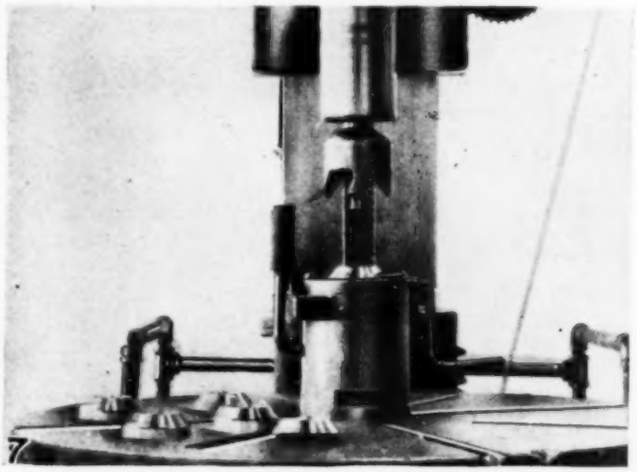


Fig. 4—Details of fixture for locating link for drilling the hole in the end of the link arm. This fixture centers the link opening sidewise and lengthwise, and a special square shows the proper location of the suspension hole in the arm



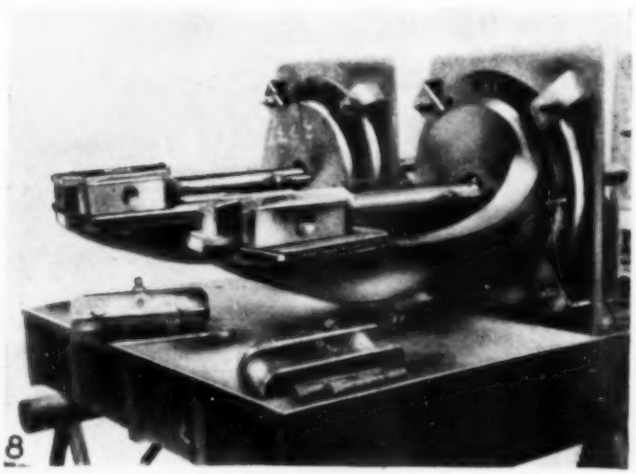


Fig. 7—Method of facing pump packing, utilizing a vertical drilling machine. A special chuck, or holder, clamps the soft metal packing in position and the forming tool, which resembles a hollow mill, does the machining. Fig. 8—Device for lining up back steam chest head. The angle plates represent the ends of the steam chests on which the heads are located by means of suitable dowels. This method saves time in assembly

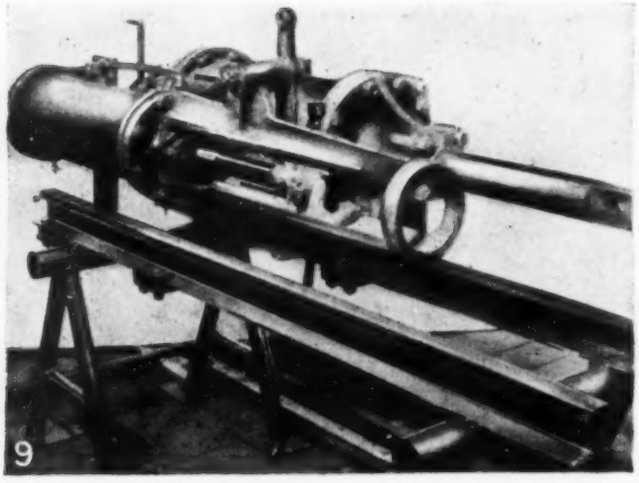


Fig. 9—Rack on which the reversing gears are repaired. This rack is built up of discarded boiler tubing and two pieces of old rail, welded into a substantial unit. The supports for the reversing gear can be adjusted along the rails to any desired point.

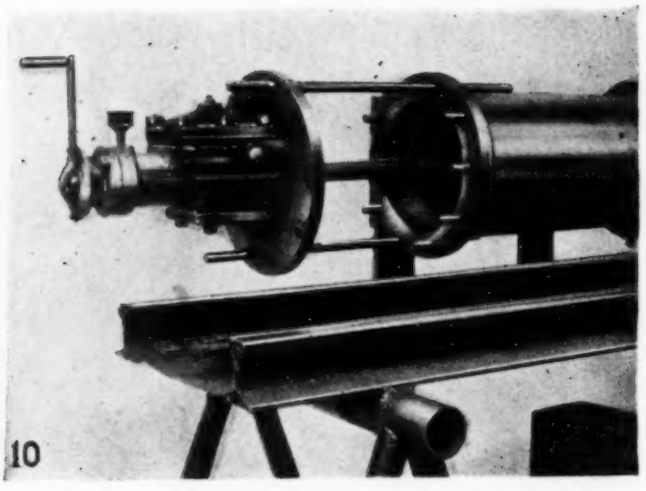


Fig. 10—Method of applying the back head of a Franklin reverse-gear cylinder. Using two rods through opposite bolt holes in the flanges, the weight of the back head can be easily supported and guided into position over the remaining studs, the screw moving the head easily into place

have been accurately centered, the holes at each end are drilled and reamed.

The centering device shown in detail at *A*, Fig. 4, consists of a stud, threaded at one end, and having a cone that forces two round-ended pins into contact with the inner surfaces of the link. This stud is controlled by a squared end at the top.

Positioning the link lengthwise and with relation to the radius also, is easily done. Lines $\frac{1}{16}$ in. apart are scribed on the upper surface of the centering device *B*, and make it easy to equalize the arc of the link by bringing it to coincide with an equal number of divisions at each end of the plate. Centering the link lengthwise is done by the gage *C*. The hole in the center fits over the central pin, and the graduations on the ends of the gage make it easy to secure an equal adjustment. All this is done before the upper side of the link is put in place, the link being held against the projection *A*, Fig. 3, by a small strap *B* at each end. Two spacing studs *D*, Fig. 4, hold the sides, or cheeks, the proper distance apart, they being adjustable by the nuts shown on the upper end.

The trunnions are used for centering the side plates on the links. The V-clamp carries a center punch mark *E* designated by a circle. This punch mark is 3 in. from the center of a $3\frac{1}{4}$-in. trunnion, and when plates having undersized trunnions are used, shims are placed between the trunnions and the clamp until the 3-in. distance is secured.

There is still another measurement to be made, that of laying out the center of the link foot to the correct distance from the center of the link. The specially marked square shown at *H* lines up the center of the link and the hole *J*, as shown by the dotted lines. By scribing the short blade of the square at the correct distance for the hole *J* on different sizes of links this hole can be easily laid out. The square is so marked that by placing the outer edge of the long blade against the fixture, the proper offset distance for the hole is shown by a mark on the short blade.

One of the operations on the side plates of the links is shown in Fig. 5, where the trunnion is being turned in a vertical milling machine. This, of course, is not an unusual operation, it being very similar to the method frequently used in turning crankpins after they have been mounted in the driving wheel. The method has been found quite satisfactory if a rigid toolholder is used, and the cut is not too heavy.

The method of finishing the face of the side plate where it fits the link is shown in Fig. 6. A heavy-duty face-grinding machine is used for this purpose and while there is nothing unusual about the method, the way in which the plate is held is to be commended for its simplicity.

White metal pump packing is faced on the vertical spindle drilling machine shown in Fig. 7, with the aid of a special clamping device. The device not only holds the packing firmly, but also ejects it after the bevel face has been finished.

The back steam chest heads carry extension guides for the back ends of the valve stems. These guides must be properly aligned in order to assure satisfactory running. In order to save time in assembling the heads when the engine is being erected, they are first checked on the surface plate shown in Fig. 8. Here the steam chest heads are clamped against the angl plate at the right and properly centered by means of the dowels shown. After they have been clamped in position, it is an easy matter to align the guiding surfaces square with the face of the steam chest covers, and in this way save considerable time in the final assembly. It will be noted that the substantial baseplate on which the assembling is done is supported on horses built up from old tubing.

All types of power reverse gears can be repaired and tested on the rack shown in Fig. 9. The rack is built from steel tubing welded into the form shown, and carries two sections of steel rail on top. The cross supports for the reversing gears are clamped to the lower flanges of the rails and the one in front can be adjusted to any position between the two horses as may be necessary to handle gears of different types. By attaching either air or steam hose, the reversing gears can be tested before leaving the repair racks.

The back head of the Franklin precision reverse-gear cylinder is quite heavy and somewhat awkward to handle in reassembling the gear. By removing two of the cylinder studs and inserting the two rods shown, at opposite points, it is comparatively easy to guide the cylinder heads squarely in position.

Arc-Welded Steel Construction
in the Machine Tool Industry

By A. F. Davis
Vice-President, Lincoln Electric Company, Cleveland, Ohio

Most of the machine tools with welded steel construction are of the type subjected to severe strain

THE amount of capital investment wiped off the books of American industry each year through the discarding of obsolete equipment is enormous. We, as consumers, naturally foot this bill although we doubtless profit to a greater extent through lowered manufacturing costs.

However, the fact that users of machine tools discard them before they are worn out is not an unmixed blessing to the makers of these tools. It creates an opportunity for the sale of new tools it is true, but someone has to pay for the investment that the tool manufacturer has made, in designs, in patterns, in castings inventory and in finished parts.

If this cost could be passed along to the buyer of the machines, and by him to the ultimate consumer of the manufactured product, there would be little complaint—first, because the ultimate consumer is used to it, and second, because the cost to the individual would be small. Unfortunately, the tool manufacturer and his stockholders are often left holding the bag. While no statistics are available it is safe to say that if all of the obsolete and semi-obsolete patterns now carefully preserved by machine tool manufacturers were piled one on top of the other they would make a first class bonfire, and if all of the dollars represented by obsolete castings rusting away in raw materials storage were laid end to end they would make a line of dollars reaching a good long distance—perhaps the distance between profit and loss.

The substitution of steel for cast iron for the larger units of machine tools such as bases, pedestals and oil pans has real economic significance. Not only is the need for patterns eliminated but the investment in raw materials is greatly lessened, since standard structural steel shapes, which are used in place of special castings, can be purchased on almost spot delivery from warehouse or mill. Furthermore, there is no necessity for a "seasoning" period during which everything stops but interest charges.

Fig. 1—A structural I-section and several steel plates are welded together to form this grinder base. It is a question whether the plan called for an unsymmetrical base or not

There are other factors of economy no less significant but suppose we cease for the moment to speak of the machine tool industry as a whole, and adopt a devil-take-the-hindmost attitude toward the selfish interests of the individual manufacturer.

Let us assume at the outset that by means of arc welding steel can be substituted for cast iron in the manufacture of machine tools. Later we will discuss how the substitution is made and what manufacturers are already doing it.

Standard hand books give the ultimate tensile strength of commercial cast iron as 15,000 lb. per sq. in. and of ordinary rolled steel as 55,000 lb. per sq. in. On this basis, the ultimate tensile strength of steel is slightly more than 3½ times that of cast iron. Steel is also more uniform in structure and in strength than cast iron. Referring again to standard hand books we find that the recommended factor of safety for cast iron is ten and for steel six for ordinary conditions.

The working tensile strength of steel on this basis is then 9,166 lb. per sq. in. and of cast iron 1,500 lb. per sq. in. Expressed briefly, in working strength steel is somewhat more than six times as strong as cast iron in tension.

Since the cost of rolled steel is generally less than that of cast iron it will be seen that here is an incentive to study the possibilities of substituting steel.

The relative weakness of cast iron in tension is well known to all machine tool designers but there exists a misapprehension as to another characteristic so wide spread that it is worthwhile to mention it here. That is the belief that cast iron is more rigid than steel, whereas just the reverse is true. It is difficult to believe that if two springs of equal dimensions, one of cast iron and one of steel, are stressed equally the cast iron spring will deflect more than the steel spring.

Reference to hand books will prove the truth of this statement. The modulus elasticity of steel is 30,000,000

Fig. 2—A 200-ton press brake built of arc-welded steel by the Kutscheid Manufacturing Company, Chicago. Structural steel is used for the flywheel as well as for the framework

Fig. 3—This combination punch and shear, built by the Kent-Owens Machine Company, Toledo, is a good example of what can be done with welded construction when the design is worked out carefully

Fig. 4—The manufacturers of the Kent-Owens machine (Fig. 3) guarantee its frame to be not only unbreakable but also absolutely free from loosening of the side members

Fig. 5—Hydraulic flanging press of 75 tons capacity built of steel plate fabricated by arc-welding. Note the clean lines of the design and the absence of increase of section at the throat

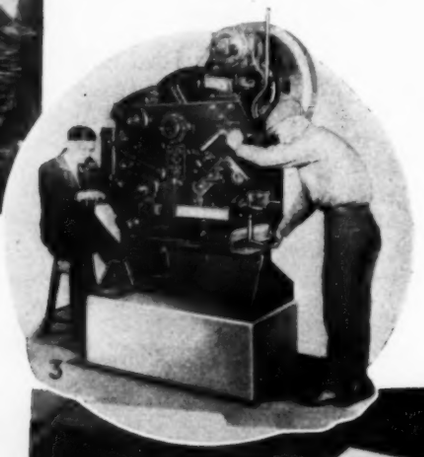
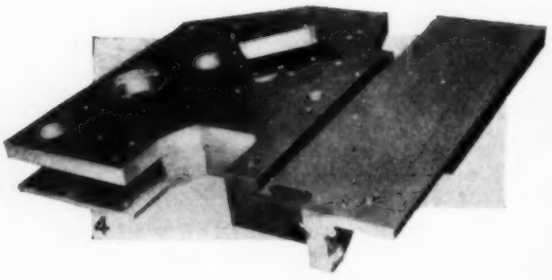
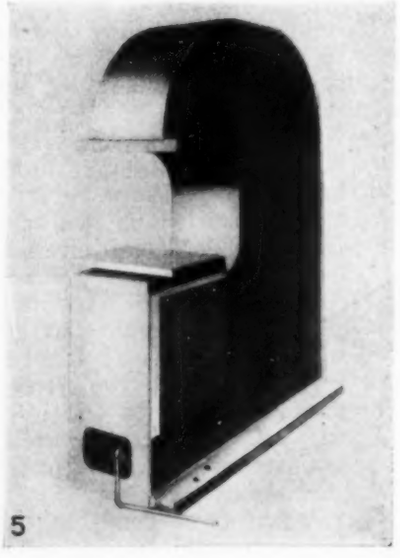
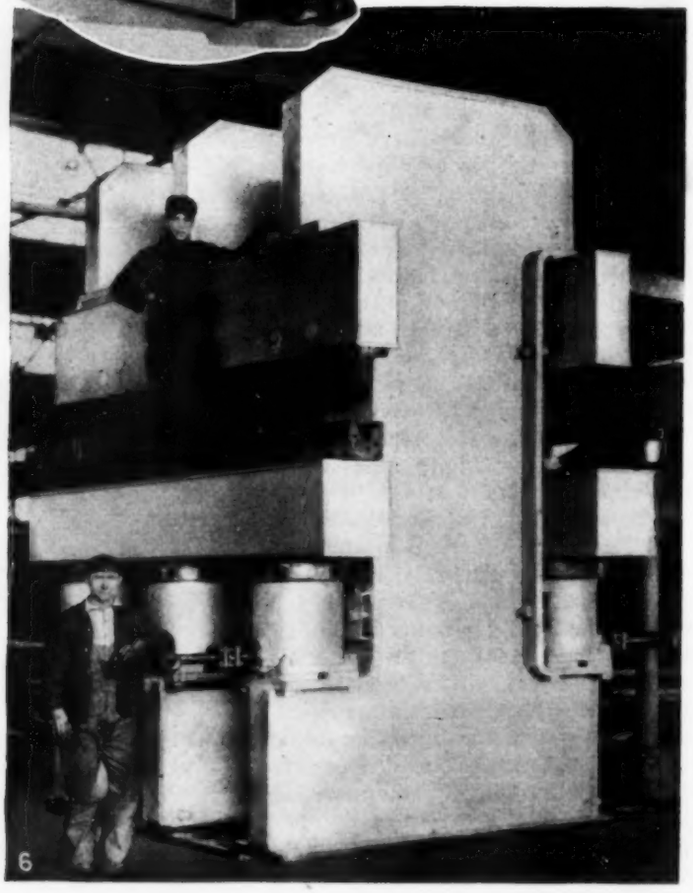


Fig. 6 — A 1,000-ton press constructed of welded steel by the Pacific Steel Boiler Corp., Waukeegan, Illinois. It looks a little modernistic but even the most conservative of us would soon get used to it







while that of cast iron is 12,000,000, which can only mean that steel is 2½ times as rigid as cast iron.

It is sometimes urged by the advocates of cast iron construction that 12,000,000 lb. per sq. in. is not a fair figure for cast iron because cast iron really has a variable modulus which is higher for low stresses and lower for high stresses. The conclusion is drawn that for the low stresses used for cast iron the modulus is in its higher ranges.

The facts are that the actual maximum modulus for low stress is not so high as to seriously affect the conclusions of this article. Hütte's handbook (German) contains the most reliable data on this subject known to the writer. This authority states that the modulus is 15,000,000 for low stress and 10,500,000 for high stress. The figure of 12,000,000 here given seems a fair average. The potency of the facts is not materially altered if we change the advantage of steel from 2½ to 1 to 2 to 1 as we would do if we wanted to use enough cast iron to keep the stress down to these limits which give 15,000,000 instead of 12,000,000 for the elastic modulus.

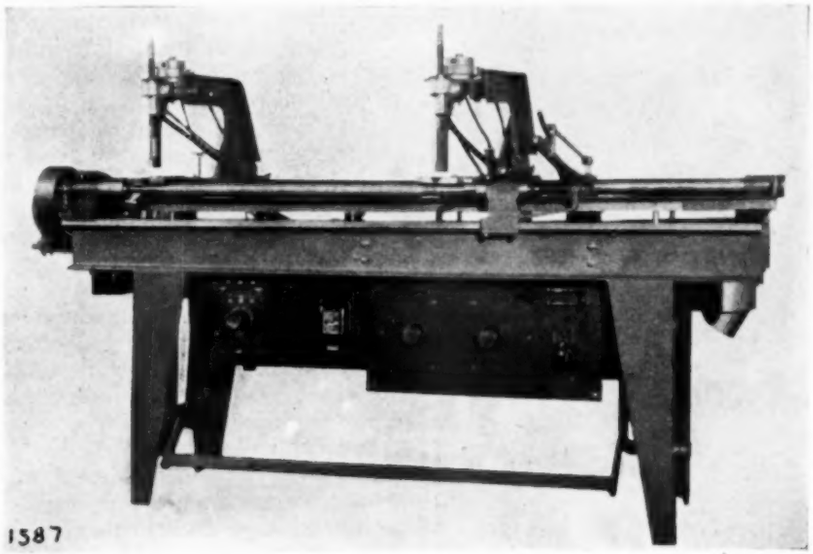


Fig. 7—A special machine illustrating the fact that if care is used in design the appearance of a welded steel machine is as pleasing as that of machines of conventional design using cast iron

The significance of this superiority of steel is this. A lathe manufacturer who prides himself on the rigidity of his lathe bed could have made this tool 2½ times as rigid by building the lathe bed of the same weight of steel, assuming, of course, that the depth of section was the same in each case. Or the same rigidity could be secured by using only 2/5 as much steel by weight.

Since rigidity and strength are the prime requisites of most machine tools it is apparent at least that steel is superior to cast iron for this service providing it can be utilized economically.

The arc welding process seems to offer this possibility. By means of arc welding it is possible to build up structures even more intricate than can be cast. Since steel has an initial price advantage of about three to one this substitution can usually be done at a profit.

The time has passed when the strength and dependability of a welded joint was in question. An arc-welded joint can be made to develop 100 per cent of the strength of the members joined.

Furthermore, the quality of an arc-welded joint can be determined by visual inspection with a high degree of accuracy. It only remains to learn to utilize steel it its commercial forms to build up structures which heretofore have been cast, and this requires real ingenuity.

Let us consider bases first, because they usually represent the largest part by weight of any machine tool. Representative of a large class of bases is the one illustrated in Fig. 1. Here the base merely serves to support the grinding wheels at the proper working height.

The customary way to make a base of this sort is to design an elaborate box-section casting requiring a special pattern and core box for each model, a deep foundry flask, an elaborate core setting operation and a certain amount of good luck in pouring the thin walled casting.

Then there is the door—though why there should be it is difficult to say, for its cost far out weighs its utility, as anyone who has fitted one will testify. Frequently the cast-iron door warps out of shape in cooling and the drilling, counterboring and filing are slow and expensive operations to say the least.

By contrast note the construction of the simple steel base, made from a length of standard I-beam with cover and base plates welded in place. Triangular braces are added in this case more for appearance than for strength.

From the standpoints of strength, rigidity, weight and economy the welded steel base is superior to the cast base.

This simple base is mentioned because it is typical of a large number of machine tool bases. Lathes, drills, buffing wheels, saw filing machines and many other tools are generally supported on box section castings. Simple welded structures will eventually replace these in many instances.

It is interesting to note, that among the first machine tool builders to use arc-welded steel construction for complete tools are the manufacturers of heavy presses, brakes, and shears. This is significant because of the severe stresses on the arc-welded joints.

In Fig. 2 is shown a 200-ton press brake built by the Kutscheid Manufacturing Company, Chicago, Ill. The side frames of this tool are of steel plate 4 in. thick. The illustration clearly shows the method of construction. The main drive gear on this brake is 6 ft. in diameter and is also of arc-welded steel. The web is cut from ¾-in. flat plate. Around this disk was arc-welded a rim which was rolled up from 2-in. x 4-in. cold-rolled bar stock. Hubs of rolled steel are arc-welded on both sides of the hub.

Another completely arc-welded machine is a combination punch and shear manufactured by the Kent-Owens Machine Company, Toledo, Ohio, illustrated in Figs. 3 and 4. Here the side members are of open hearth steel welded together through intermediate steel forgings. Obviously there is no possibility of the side members loosening in service.

An hydraulic press made by the Youngstown Welding

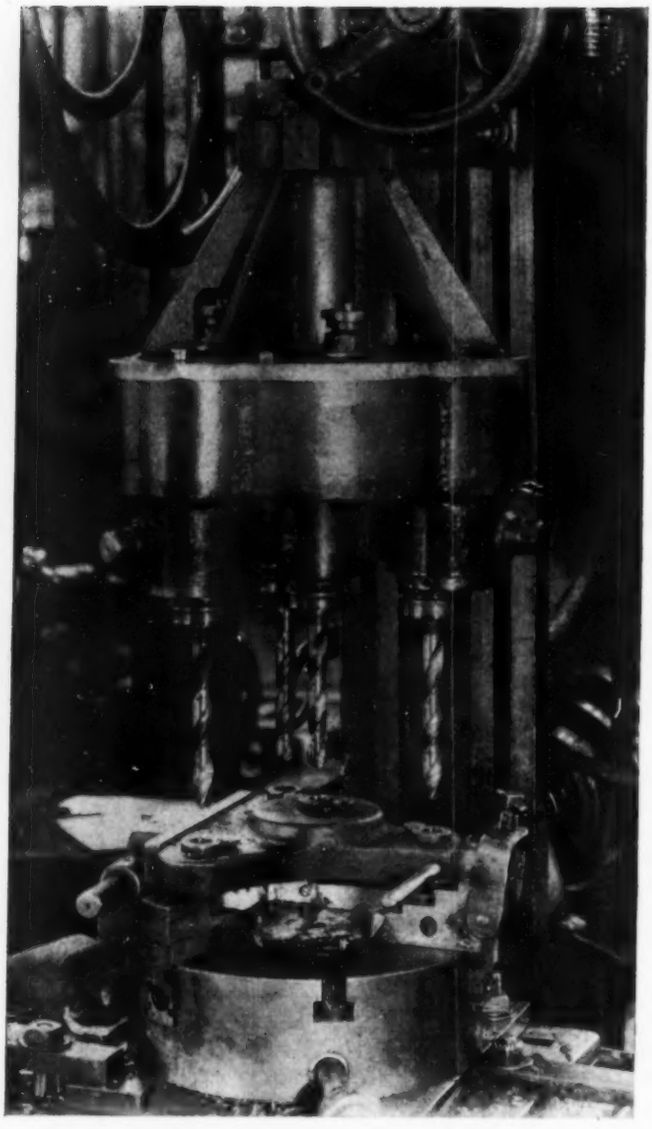


Fig. 8—A multiple-spindle drill head built by the electric arc-welding process by the DeLaval Separator Company

Company, Youngstown, Ohio, is illustrated in Fig. 5. This tool is particularly interesting because the frame resembles the general form used for most punching and stamping presses. Whereas in cast iron frames for presses it is customary to increase the section at the inside of the throat, with steel this is not necessary. The 2-in. plate used for the side members is equivalent in tension to a cast iron section 12 in. thick. It will be readily appreciated that great strength is secured in this machine with a considerable saving in weight.

One of the best illustrations of the use of welded steel in the manufacturer of this type of equipment is shown in Fig. 6. The Pacific Steel Boiler Corporation of Waukeegan, Ill., having had long experience in the use of welding in the manufacture of their steel boilers, naturally knew of the advantages of using steel and consequently, when in need of a 1,000-ton press, wanted one of steel in order to secure the maximum rigidity. There did not seem to be any on the market which filled their wants so they decided to build their own; with the results shown. This press weighs 70 tons and is operated by hydraulic pressure of 1,700 lb. per sq.-in. It is used to form $\frac{1}{8}$-in. steel boiler plate for fire box walls.

There are several other presses and brakes of all-arc-welded steel construction on the market or in process of design, but those featured here are typical of the general construction.

Another special machine, which resembles a speed lathe, is illustrated in Fig. 7. The bed, legs, headstock and toolholders are all of steel. This illustration is introduced to show that, if care is used in the design, welded steel machines are as pleasing in appearance as machines of the conventional design.

In the construction of special machinery the savings possible by the substitution of arc-welded steel are particularly important because the pattern expense is eliminated. This item, if it must be charged against one or two machines, is often a very large percentage of the total cost.

An example of special equipment built of welded steel is the multiple-spindle drill head illustrated in Fig. 8. This four-spindle head was built by the DeLaval Separator Company of Poughkeepsie, N. Y., for its own use and is certainly an ingenious application of the welding process.

The various types of machine tools mentioned previously in this article are indicative of what is being done in the way of redesigning for better and more economical construction. Many machine tool manufacturers have preferred to go slowly, redesigning only the simpler parts of their product for arc welding. Profiting by experience and gaining increased confidence in the new method of construction, these manufacturers of machine tools are gradually redesigning more and more of their machinery until in the very near future their designs will be completely revamped for welded construction. Such a procedure is commendable in that errors in design and execution are less frequent and less costly.

The extremely rapid growth of applications of the electric arc welding process in the building of machine tools makes it well nigh impossible to prophesy with any degree of accuracy as to how soon the traditional method of construction will be universally overthrown in favor of the more modern and more economical methods of machinery building. It is at this time safe to say that those who now adopt welding as a machinery building tool will, by virtue of the experience gained, be placed in a commanding position in the machine tool industry in the near future.

Broadening Our Reader Service

New designs and new materials are being presented in such rapid succession to the metal-working industry that something is needed to digest the vast amount of descriptive matter for the busy executive.

The Shop Equipment News section of the *American Machinist* has been doing just this for machinery, equipment, and materials being offered as new on the market. It is now proposed to extend this service to include a digest of recent patents relating to the metal-working industries.

This review will be given as an addition to the Shop Equipment News section, and will consist of a short survey of the most important designs, new materials, and processes on which American patents have been issued.

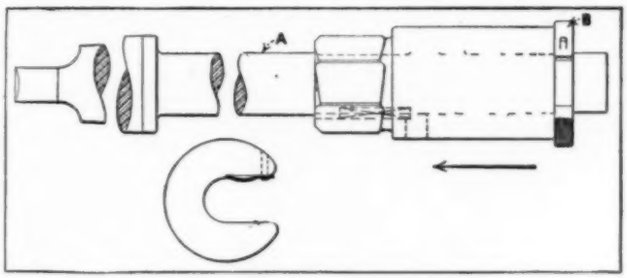
IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

A Back Counterbore

By H. F. Mack

The back counterbore shown in the illustration is very simple in construction. It has a long straight portion of any suitable length, depending upon the length of the work through which it has to pass, and a taper shank to fit the spindle of the machine in which it is used. The straight part *A* is a running fit in the jig bushing. The cutter fits on a reduced portion of the bar, against a shoulder, and is provided with a key to drive it. The



Details of the back counterbore

washer *B* fits over a neck in the bar and takes the back thrust of cutting. It is fitted with a flat spring to prevent it from being jarred out of place.

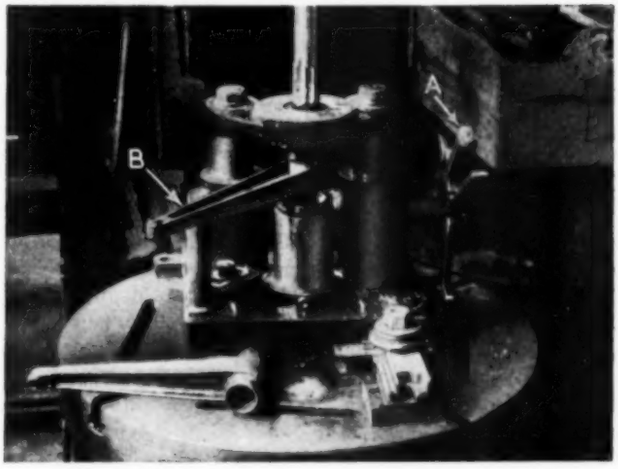
In use, the washer is slipped out of place, permitting the cutter to be removed from the bar. The bar is then passed through the hole in the work, the cutter is replaced and the washer is put on. The counterboring is, of course, done by feeding the bar backward, in the direction shown by the arrow. It is necessary to depend upon the tightness of the taper shank in the spindle of the machine to hold the bar against the thrust of the cut, unless a draw-in rod can be used.

Reaming Fixture in an Airplane Shop

By Frank C. Hudson

Another indication that airplane construction is reaching a commercial stage is indicated by the reaming fixture illustrated herewith. This fixture is for reaming the large hole in the upper aileron horn by which the aileron is controlled from the pilot's seat. The horn fits over a tube that forms the backbone of the aileron, and is pinned to it. As can be seen from the horn on the table, this member is built up from tubing and flat pieces welded into a complete unit.

The horn is held in position between two hollow cones in line with the reamer. The lower cone is stationary, and is held in the base by headless setscrews. The upper cone has sufficient vertical movement to permit the end of the horn being placed in position, after which it is



A self-centering reaming fixture

moved down until the piece is centered between the two cones. This movement is controlled by the lever *A*, which can be held at any point by a latch. The bushing plate is guided by two substantial plungers, each having a rack on the back which is actuated by a pinion on the cross-shaft behind them. The stop *B* takes the turning thrust of the reamer.

Measuring Within 0.004 In., With a Transit

By K. K. Hoyt

In testing the foundation settlement of a large hydraulic press in the print shop of the U. S. Coast & Geodetic Survey, a method of leveling was developed which gives elevation differences within 0.1 mm. (0.004 in.). As far as is known, no greater accuracy in leveling has been reached. This result was obtained by aid of the micrometer attachment on a precision level. The same method applies to increase the accuracy of readings taken by any instrument equipped with a gradienter screw. It is pointed out that the detection of minute changes in the elevation of machine foundations facilitates the determination of any gradual settlement within a shorter period than would be otherwise possible. This permits immediate steps to prevent the formation of stresses sufficient to cause trouble.

Under the working conditions, insufficient headroom prevented the use of a rod, so that a tape graduated to centimeters was substituted. The tape was hooked to special brass plug bench marks, held along a plumb line, and illuminated by an extension light. The instrument used had an optical means of viewing the bubble from the eye end and a sensitive micrometer adjustment for slight tilting. The three horizontal wires in the field

were each read according to the following program and the mean taken for a reading of the tape. First, an observation was made with the instrument bubble in the center of the tube. Then the instrument was tilted so that the hair being read bisected the next centimeter mark below; then the next mark above. Tape and micrometer head readings were recorded for each of these three steps. This series of observations gave an instrumental subdivision of the centimeter space based on the proportion arising from the various micrometer readings. In the case cited, the difference in elevation between two plugs as determined from independent set-ups usually agreed within 0.1 mm. and never was out more than 0.2 millimeter.

Renewable Bearing Liners

By Chas. B. Irmer

The problem of replacing a number of roller bearings with babbitted ones was recently referred to the writer. The machines were in the field, and it was considered impracticable to babbitt them in place, or to dismantle and bring them into the shop. Under these circumstances it was decided to use a babbitted sleeve bearing, the outside diameter of which would be the same as that of the roller bearing it displaced. The illustrations show, in part, the methods used.

Cast-iron liners as shown in Fig. 1 were machined on surfaces *A*, *B*, *C*, and *D*. The dovetail *B* was intended to act as an anchorage for the babbitt. The fixture shown in Fig. 2 was made up to hold the sleeves while babbitting. The diameter of the arbor *F* was the same as the shaft diameter of the machine, and the liner G was the same thickness as the liners to be used in the finished bearings. Half round brass rod *H* was secured to the mandrel to form oil grooves in the babbitt of the desired form.

Two of the half liners were clamped to the fixture with the turned surface *D* central with the arbor. The liners and fixture were preheated, and the babbitt was then poured. Inspection showed that the surface of the babbitt next to the mandrel had cast smooth enough to make machining unnecessary. After fitting, they were clamped to a mandrel identical with the one used in the babbitting fixture, and turned on the outside to fit the bearing housings.

These liners were applied to forty-five bearings with no other tools than an electric drill for the dowel holes, and a hand scraper. The machines thus equipped have given perfect satisfaction to date.

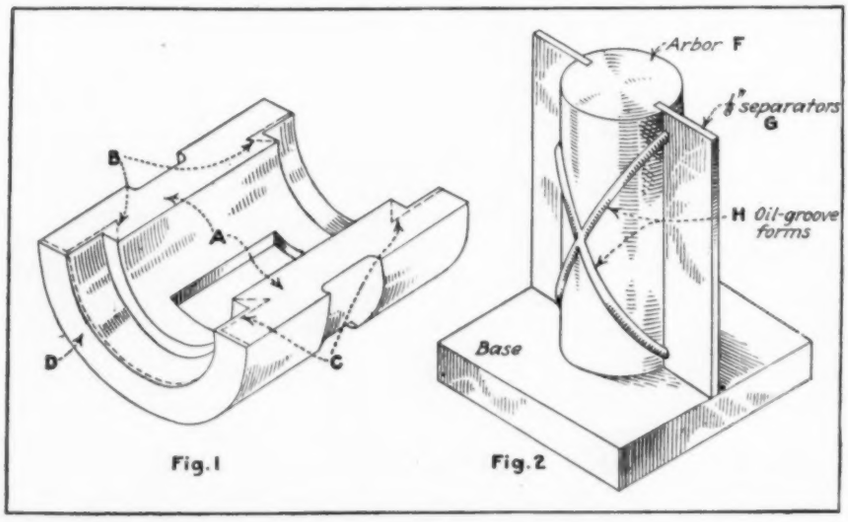
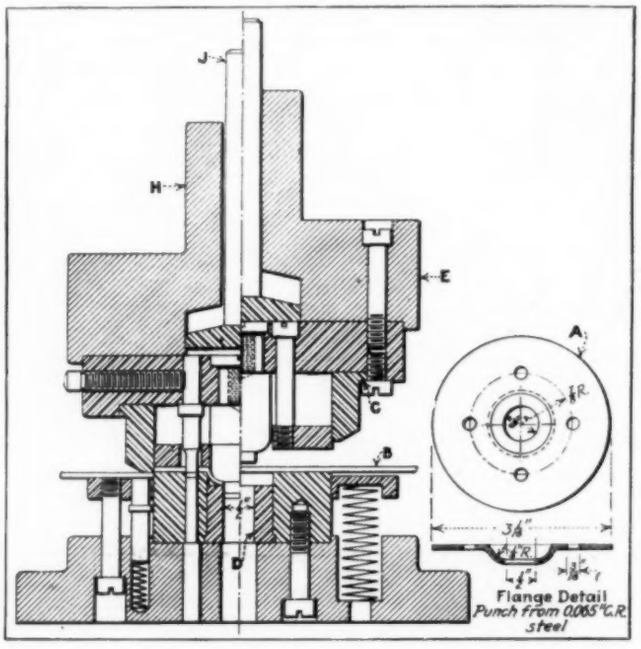


Fig. 1—Cast-iron liner. Fig. 2—Babbitting fixture for casting bearings with oil grooves

Triple-Action Press Tools

By Carl E. Schinman

The die shown in the illustration was designed for the production of the part *A*. As will be seen from the drawing, this tool blanks the part from the strip of steel to be seen at *B*, pierces the holes and forms the cup in the center. A feature of the design that lowers the cost of construction of the tool, and at the same time renders it less liable to breakage, is the elimination of screw holes in the blanking ring. This ring is clamped to the punch pad by screw heads gripping the shoulder *C*. In the punch pad are the piercing punches, and the pad is in turn fitted into a recess in the punch holder. The lower die is of the conventional compound-die construction, except for the bushing shown at *D*. This construction permits easy sharpening of the various members without destroying their original relationship. The half-section *E* shows the punch just before it strikes the material, and the half-section *H* shows it at the completion of the stroke, with the work blanked, pierced and formed. As the punch descends, the knockout pin *J* acts upon the upper knockout members and ejects the finished part. The cost of the die is high, but is warranted for large production.



Details of triple-action press tools

Design of Shafts for Stiffness

Calculation of Deflections

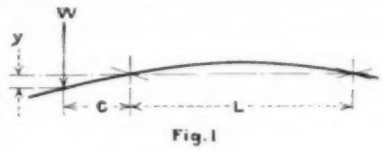


Fig. 1

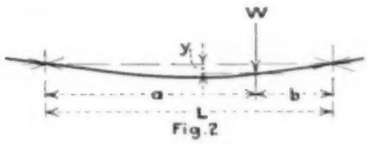


Fig. 2

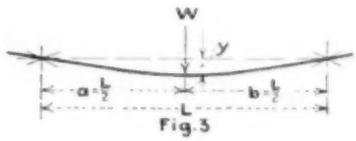


Fig. 3

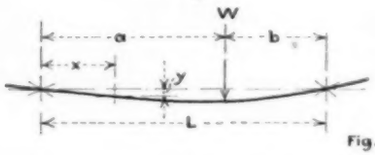
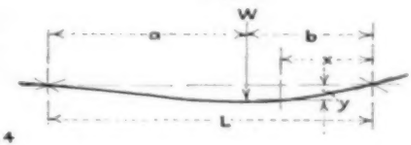


Fig. 4



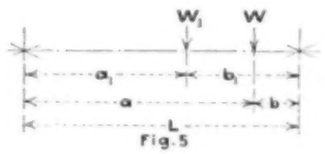


Fig. 5

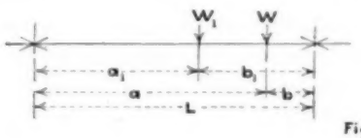


Fig. 6

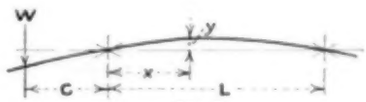


Fig. 7

The following formulas give the deflection of machine shafts under various types of loading. In all cases L is taken as the distance from center to center of bearings, the modulus of elasticity E as 30,000,000 and the moment of inertia I for circular sections as $0.04909\ D^4$.

Fig. 1—Single overhung load, to find deflection y *at load* W.

$$y = \frac{WC^3}{3\,EI}(C+L) = \frac{WC^3}{4{,}418{,}100\,d^4}(C+L) \qquad (1)$$

Allowable deflection $= 0.0015\,C$.

Fig. 2—Single load at any point between bearings, to find deflection y *at load* W.

$$y = \frac{Wa^2b^2}{3\,EIL} = \frac{Wa^2b^2}{4{,}418{,}100\,d^4L} \qquad (2)$$

Allowable deflection $= 0.0015\,b$.

Fig. 3—Single load central between bearings, to find deflection y *at load* W.

$$y = \frac{WL^3}{48\,EI} = \frac{WL^3}{70{,}689{,}600\,d^4} \qquad (3)$$

Allowable deflection $= 0.0015\,a$.

Fig. 4—Single load at any point between bearings, to find deflection y *at any distance* x *from bearing.*

For x distance from left-hand bearing,

$$y = \frac{Wbx}{6\,EIL}(L^2 - x^2 - b^2) \qquad (4)$$

For x distance from right-hand bearing,

$$y = \frac{Wax}{6\,EIL}(L^2 - x^2 - a^2) \qquad (5)$$

Fig. 5—Two loads at different points between bearings, but in the same plane, to find the deflection at either of the loads.

To find the deflection at load W, calculate the deflection at load W for each load independently, and add these deflections for the total deflection.

Deflection at load W due to load W

$$= y = \frac{Wa^2b^2}{4{,}418{,}100\,d^4L}$$

Deflection at load W due to load W_1

$$= y_1 = \frac{W_1a_1b}{8{,}836{,}200\,d^4L}(L^2 - b^2 - a_1^2) \qquad (6)$$

The allowable deflection at load $W = 0.0015\,b$.

To find the deflection at load W_1, proceed as above but use the following formulas:

Deflection at load W_1 due to load W_1

$$= y = \frac{W_1a_1^2b_1^2}{4{,}418{,}100\,d^4L} \qquad (7)$$

Deflection at load W_1 due to load W

$$= y_2 = \frac{Wa_1b}{8{,}836{,}200\,d^4L}(L^2 - a_1^2 - b^2) \qquad (8)$$

Fig. 6—Two loads at different points between bearings and in different planes, to find the total deflection at load W *or* W_1.

First, find the deflections for each load independently as in the example of Fig. 5. Then, take the resultant of the two deflections. The resultant can be easily determined by plotting the deflections y and y_1 to some convenient scale, the diagonal of the parallelogram representing the direction and magnitude of the resultant.

Fig. 7—Single overhung load, to find maximum deflection y *between bearings, and its distance* x *from left-hand bearing.*

$$y = \frac{WCL^2}{15.55\,EI} = \frac{WCL^3}{22{,}900{,}485\,d^4} \qquad (9)$$

$$x = 0.4226\,L \qquad (10)$$

The allowable deflection depends upon whether there are gears on the shaft at, or near, the point of maximum deflection. Should there be a gear so located, the deflection of the shaft due to the gear should be determined, as in the example in Fig. 2. The resultant of the two deflections should then be determined as in Fig. 6.

The allowable deflection, in this case, also depends upon the direction of the resultant deflection. If the direction is such as to force the driving and driven gears into closer engagement, the total deflection should not exceed 0.001 in. or the gears may be noisy. When the deflection separates the gears, from 0.005 to 0.008 in. may be allowable, depending upon the pitch of the gears. The coarser the pitch the greater the allowable deflection. The combined separation of the two shafts at the gears should not exceed 0.005 to 0.008 inch.

By G. W. Drake, Advance Designer, Warner & Swasey Company

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

The Dark Ages of Transportation

LAST month the Pennsylvania Railroad published an excellent information bulletin on the transcontinental rail and air service that is to begin in the spring. In the bulletin is a map showing how the route is divided for day travel by airplane and night travel by sleeping car.

To make the contrast between the two areas as sharp as possible the draftsman has shaded rather heavily the portions where travel is by rail. He has taken the precaution to mark these shaded portions "Night," which is fortunate because otherwise the casual reader might well get the impression that travel by plane is the modern method while travel by rail lies in the dark ages of transportation.

Judging from the rate at which passenger traffic is deserting the railroads for the private automobile and the bus it would not be unreasonable to accept the designation just given. But if we are to believe the contention sometimes heard, that railroad passenger traffic is carried at a loss or at small profit, at best, it would be better to conclude that what the railroads face is not the disaster of oblivion but the problem of adjusting their service to meet current needs. Under the handicap of severe governmental regulation the task is not an easy one, but it must be accomplished, no matter what the cost. It may even be necessary to undertake thorough modernization of the repair shops and their equipment, some of which is unquestionably a survival from the dark ages.

Not an Unmixed Evil

IN A certain plant, which shall be nameless, little has happened for a long time to disturb the even course of its business. Years ago, a machine was invented by its owner that was so far ahead of anything then known that a practical monopoly resulted. Sad to say, the company coasted along on this wave of business without any appreciable effort to make further improvements. It was aided in this course by equal apathy on the part of its few competitors.

Much of the product went to automobile manufacturers, with whom the company's relations were of the best. But competition in the automobile field increased in intensity and presently the production heads of the automobile companies found that selling price was not to be based on cost of production, but on the market. That meant a general tightening up all along the line and eventually the product of the company in question came up for consideration. The only way to meet the problem of the production men was a drastic reduction in the prices they were paying to their parts suppliers and this product was no exception.

The company was told that the buyers would pay only a certain fraction of the old price in the future, and that new sources would be developed if necessary. Naturally there was a loud complaint from the men who were thus disturbed from their long tranquillity, but finally they decided to meet the inevitable and do a little studying of their own methods.

As a result they were soon able to meet the price offered by their customers, and since then they have made further improvements and cut it still more without impairing their own profits.

Here is one case, at least, where the demands of a hard pressed purchasing agent were not an unmixed evil.

A Sensible Move

REALIZING that two large exhibitions in the same field during the same year are unnecessary, besides being wasteful, the general committee of the New Haven Machine Tool Exhibition, Inc., has sensibly called off the eighth show, tentatively scheduled for September, 1929. This action allows the industry to concentrate its efforts on the second National Machine Tool Builders' Exposition to be held in Cleveland, September 30 to October 4, at the public auditorium.

The New Haven show was organized as an educational enterprise in 1921 by the local section of the A.S.M.E., the Sheffield Scientific School of Yale University, and the New Haven Chamber of Commerce. It was intended to foster interest in the machine tool industry which was at that time without any well-organized annual exhibition of this kind, particularly in New England. The rapid growth in size of succeeding exhibitions testified to its usefulness. This year it would have labored under a severe handicap in that many of the builders have agreed to exhibit their equipment only at their own show. In view of all these circumstances the general committee is to be congratulated upon its discretion.

· SHOP · EQUIPMENT · NEWS ·

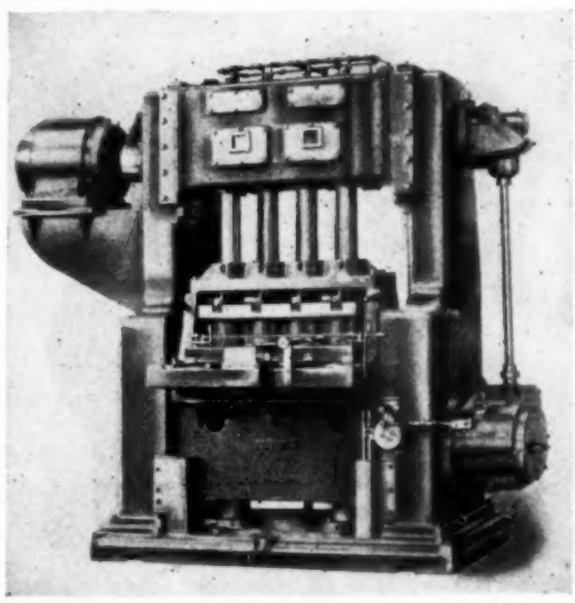
Defiance No. 8 Special, Extra-Heavy, Four-Spindle, Cylinder-Sleeve Boring Machine

TO MEET tractor and gas-engine manufacturers' requirements for rough, semi-finished or finished boring or reaming of cylinder sleeves, four at one time, this special, extra-heavy No. 8 boring machine has been developed by the Defiance Machine Works, Defiance, Ohio. Production is quoted at 50 to 100 sleeves per hour for any one operation.

The frame and base castings are of extra broad and heavy design, with cored centers heavily ribbed inside, and having broad and long slides scraped and gibbed. The heavy design is necessary to overcome chatter. The center section of the fixture is mounted on a sliding table operated by a means of an air cylinder for opening and closing. The cylinder is equipped with a pressure gage and air reducing valve for operation at 60 lb. per sq.in. The reducing valve is suitable for operation on main air-line pressures from 60 to 100 lb. per sq.in. The top of the fixture is supported with a bushing plate and hardened jig eye to pilot the boring jar before entering the sleeve. A pair of heavy jack screws are used to raise and lower the table. Each screw is large in diameter, and is actuated by a heavy worm gear through a bronze nut. Each jack is a unit in itself, and the moving parts are packed in grease. A simple adjustment for advancing or retarding the screws independently is provided to maintain perfect alignment of the table. All thrusts are taken by heavy-duty ball bearings. The feed mechanism is of unit construction and is easily accessible. It is tightly incased and retains a sufficient level of oil to effect a splash system of lubrication. All feed shaft bearings are bronze bushed and use SKF ball thrust bearings. Feed changes are made by simply removing the cover of the gear case and changing two gears. Hand adjustment for the table feed is provided, but when the machine is in operation, the table feeds automatically up to the boring tools at a rapid rate, and when through the cut, it reverses automatically to a fast travel, and returns to its loading position and stops until engaged to bore the next cylinder. By means of double clutches in the feed box, the machine can be set to feed, disengage, rapid travel up, feed again, disengage, and return automatically.

The large diameter spindles are made of hammered alloy steel, and are supported by three bronze bearings. The nose bearing is conical in shape, and has a convenient means of adjustment for taking up wear. Each spindle floats between two sets of large size bearings, which receive all end thrusts. After the power is shut off, the spindles can be stopped instantly by means of a friction brake located close to the operator. The boring tool is fitted to the spindle by means of a tapered shank, and is held securely in place by a long bolt leading through the spindle from the top. The drive to the spindles can be transmitted by belt from the three-step cone pulley, or from a motor connected by a flexible coupling to the drive shaft.

The power required varies between 15 and 25 hp., according to the work. The floor space occupied is 48x118 in., and the weight is 18,000 lb. net.



Defiance No. 8 Special, Extra-Heavy, Four-Spindle, Cylinder-Sleeve Boring Machine

Jones & Lamson Grinder for Automatic Diehead Chasers

Simplicity, accuracy, and complete protection of all working parts from emery are the features claimed for this chaser grinder, which has been introduced by the Jones & Lamson Machine Company, Springfield, Vt. The machine is intended for grinding the chasers used in the J & L automatic diehead. It is driven by a ¼-hp. motor mounted on a base of the pedestal type. The motor is of ball bearing construction and runs at 3,400 r.p.m. on 110-volt, 60-cycle circuits.

Jones & Lamson Chaser Grinder for J & L Automatic Diehead Chasers

In order to provide for the two distinct grinding operations, the two sides of the grinder are designed to take independent set-ups. Micrometer adjustments reading in thousandths are arranged on each side,

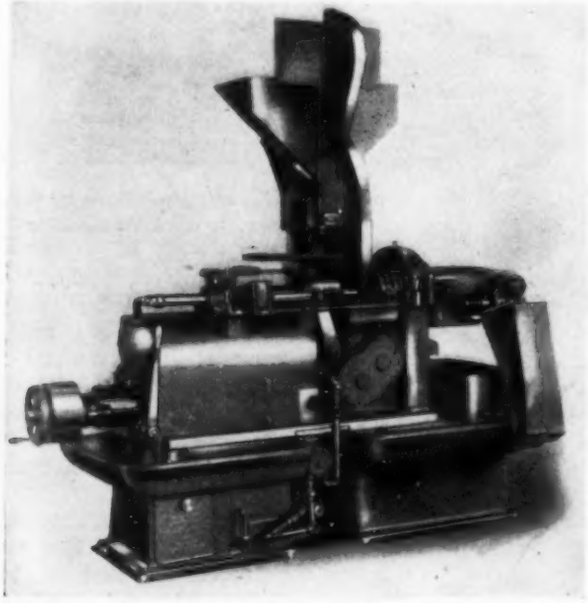
and this feature includes a vertical elevating screw. Parts of the regular J & L chaser sharpening fixture are employed to provide proper holding of the chasers. This also provides angular adjustment for chamfering on the swinging slide and angular adjustment for the top rake angles on the horizontal slide. The pinion handle for operating the horizontal slide is adjusted for position by merely withdrawing the pinion from the rack pieces, and adjusting the handle to suit the slide travel.

Automatic No. 3 "Threadnut" Nut-Threading Machine

HYDRAULIC operation and capacity to tap from $\frac{7}{8}$- to $1\frac{1}{2}$-in. nuts with either U.S.S. or S.A.E. threads are the chief features of the No. 3 "Threadnut" nut-tapping machine, which is the latest addition to the line manufactured by the Automatic Nut-Thread Corporation, 3617 N. 8th St. at Rising Sun Ave., Philadelphia, Pa. This machine is designed along the same general lines as for the model described on page 370, Vol. 67, of the *American Machinist*. It is fully automatic in operation, the nuts being loaded into the hopper, which is made of welded sheet steel and has ample capacity for the larger sizes of nuts. Production of $\frac{7}{8}$-in. U.S.S. nuts is 642 per hour, while for $1\frac{1}{2}$-in. U.S.S. nuts the production attained is 366 per hour.

A safety clutch throwout is provided, so that, should any obstruction prevent the nuts from being fed onto the tap, the machine will be stopped automatically, thus reducing the chances of tap breakage to a minimum. This device has a further automatic feature in that, after the obstruction has been removed from in front of the plunger, the clutch goes back automatically into action, so that the machine can be started by simply throwing the clutch lever in. The hopper is operated hydraulically and has a plunger-type feed.

Bent shank taps are used, and are held in place in a floating position by a train of nuts on the shank. The coolant is fed through the plunger under pressure, and plays directly into the tapping jaws and onto the tap, thus keeping the tap cool at all times. By feeding the coolant in this manner, any accumulation of chips is washed away. The various speeds required are obtained through change gears, which are operated from controls at the end of the machine. Two sets of change gears are also provided to control the speed of the feeding cam. One set is used for producing U.S.S. threads, and the other for S.A.E. threads. The machine is also equipped with a forced-feed lubrication system, which supplies lubricant to all moving parts by means of small oil lines, and every bearing is reached while the machine is in motion. Separate reservoirs are provided for lubricating oil, coolant and hydraulic oil. The spindle and backshaft are mounted on Timken tapered roller bearings.



Automatic No. 3 "Threadnut" Nut-Threading Machine

Porter-Cable Core-Print Gage

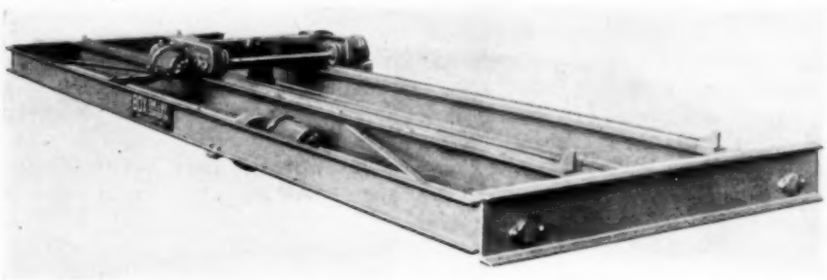
Core prints, bosses, and taper work can be obtained about ten to twenty times faster by means of this gage than when turned on a lathe, states the manufacturer, the Porter-Cable Machine Co., Syracuse, N. Y. The pattern is visible at all times, so that it is easy to follow a line. The core-print gage consists of a base, which slides in the slot on the table, a stop arm, a thumb screw, which locks the stop arm in place, and a radius arm having a piercing point at its extreme end.

Porter-Cable Core-Print Gage in place on standard table

After the circular line is drawn on the piece, the piercing point on the radius arm is placed in the center of the circular arm, the work placed against the disk, and the pattern sanded to the line. In performing this operation, the right hand is used to hold the work and the left hand to locate the stop arm, and to lock it in place by means of the thumb screw. The size of work that is practical on this gage is from $\frac{1}{8}$ to 5 in. in diam. and up to 2 in. in height.

Box Crane & Hoist Corporation's Type LHR Electric Traveling Crane

All-steel, arc-welded construction is used for the light-capacity crane manufactured by the Box Crane & Hoist Corporation, Janney and E. Ontario Sts., Philadelphia, Pa. The crane has been designed to give adequate service for buildings with a

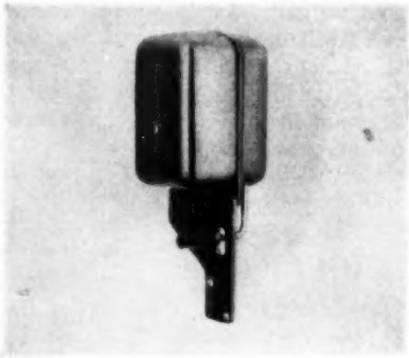


Box Crane & Hoist Corporation's Light-Capacity Standardized Arc-Welded Crane

minimum ceiling height of 10 feet. Material may be stored in the path of operation of this crane to a height within 24 in. of the ceiling. Increased speed and smooth operation and ease of control are additional features of the model. The crane is built in standardized units in spans up to 50 ft. for loads of 1, 2 and 3 tons.

General Electric Time-Delay Undervoltage Devices

Two devices, which are intended for protection against failure of voltage on power circuits, and which operate after a suitable time interval,



General Electric Type MG-2 Time-Delay Undervoltage Device with bracket for mounting on Type MK-3 motor mechanism

are being offered to the trade by the General Electric Company, Schenectady, N. Y. They bear the designations of MG-2 and PF-2, and are designed especially to trip the breaker in the circuit only after a suitable time interval, and will not cause interruptions to service when momentary voltage dips occur, due to disturbances on the line.

The MG-2 device is designed to operate in conjunction with suitable motor-operated mechanisms, and is available for use on a.c. circuits only. It has an electrically interlocked switch, which is so connected that power cannot be turned on unless the protective unit is in operative condition. This undervoltage device is especially adapted for motor and synchronous converter service.

Each device contains a motor, a helical spring and a gear train. In operation, the motor runs and keeps the spring compressed through the gear train. Upon drop of voltage, the spring reverses the motor and runs the gear train in the opposite direction. If the undervoltage persists, the travel along the gear train is completed and the circuit is broken by means of a tripping device. The time interval between the initial voltage dip and the breaking of the circuit may be varied by means of adjustments to the gear travel.

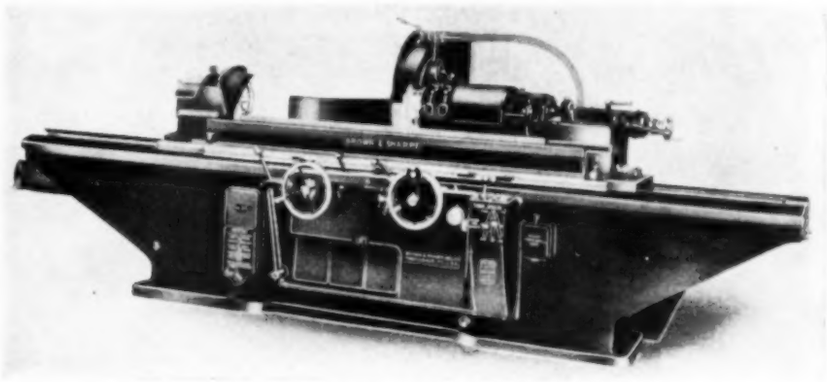
The PF-2 undervoltage device is of the solenoid and plunger type with an air bellows for time delay. The time can be varied from approximately 1 sec. to 1 min. This device can be applied to certain types of oil-circuit-breaker operating levers.

Rockwood Offset Keystock

An inexpensive assortment of offset keystock in 2-ft. lengths has been placed on the market by the Rockwood Manufacturing Company, Indianapolis, Ind. Twenty-three stock sizes are available, thus assuring wide interchangeability of pulleys and gears for any given shaft diameter. With this assortment, any millwright can mount pulleys, sprockets, coupling, and gears quickly and economically, regardless of the keyseat variations, with keys sawed to length from the handy 2-ft. stock bars. These lengths are sold by individual bars, and also in convenient packaged assortments. They are available from distributors of the Rockwood paper pulleys.

Brown & Sharpe No. 35 Plain Cylindrical Grinding Machine

LARGER size is the feature of the No. 35 machine, which has been added to the line of plain cylindrical grinding machines manufactured by the Brown & Sharpe Manufacturing Company, Providence, R. I. The machine is similar in every way to three other machines in this group, namely Nos. 30, 32, and 33, except in size. These models were previously described on page 851, Vol. 68, of the *American Machinist*. As in the smaller sizes, the tailstock and headstock centers swing work 12 in. in diam. with a 24-in. wheel, and 6 in. in diam. with a 30-in. wheel, but



Brown & Sharpe No. 35 Plain Cylindrical Grinding Machine

the centers of this model will take work 72 in. in length.

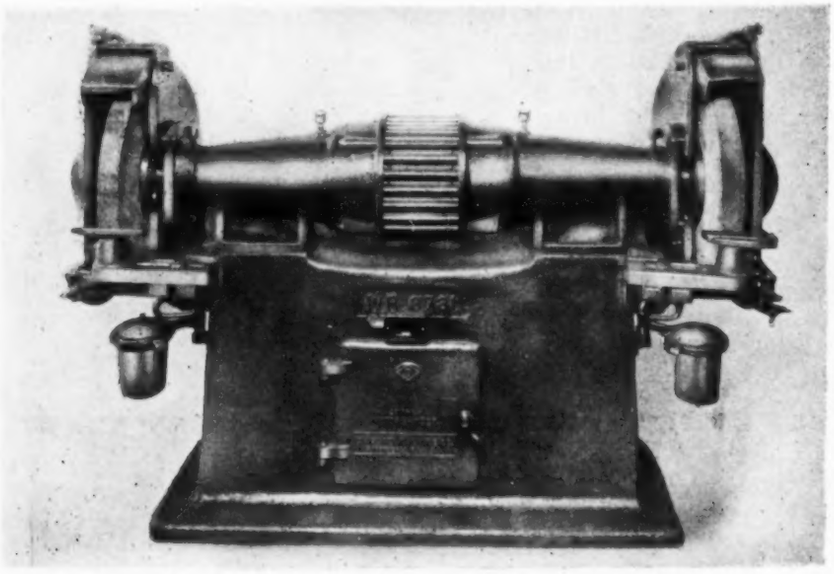
Among the features, which are common to the line, are: An especially wide range of table and work speeds; a very high table speed; conveniently grouped controls; changes of speed in the totally independent work drive; table movements that are made through sliding gears and individual levers; complete lubrication of the wheel spindle and all main mechanisms by a gravity flow of filtered oil from a reservoir, which is kept flooded by a geared pump; and choice of overhead countershaft drive by a single pulley or of drive from a motor mounted within the cabinet base.

The power required to drive the No. 35 machine varies from 15 to 40 hp., depending upon the work. The floor space required is 74x189 inches.

Diamond 20-Inch Motor Grinder

A distance of 54 in. between the two 20-in. wheels of this motor-driven grinder permits two men to work at the same time without interfering with each other. The machine has been developed and placed on the market by the Diamond Machine Company, 9 Codding Street, Providence, R. I. The motor driving the wheels is of 7½ hp., and runs at 1,150 r.p.m. It has a corrugated frame with special end pieces for through ventilation by means of vent holes in the column. The motor is mounted in a pair of ball bearings at each end of the spindle, and it is started and stopped by means of a magnetic switch at the pushbutton station.

The height of the center of the spindle from the floor is 32 in. The two 20-in. wheels, having 2-in. faces, are mounted within heavy iron Safety Code wheel guards with adjustable wings for wheel wear. Tight and loose rests are provided. The base is 50 x 17½ in., and the overall distance between the outside edges of the wheel guards is 68 inches.

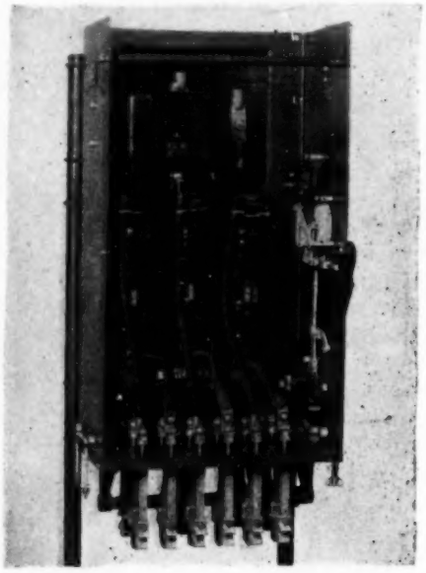


Diamond 20-Inch Motor Grinder

General Electric Compensator of High-Interrupting Capacity

High-interrupting capacity is the feature of a manual starting compensator, which has been announced by the General Electric Company, Schenectady, N. Y. The apparatus, which bears the designation of CR-1034-K-33, is especially applicable to the control of high-speed, squirrel-cage motors, including all two- and most four-pole motors, particularly those driving loads of relatively high inertia and, therefore, taking high inrush currents and requiring considerable time to get up speed. For such applications, the high capacity of the contact mechanism of this compensator is said to be especially suitable.

Among the advantageous features claimed for the compensator by the manufacturer are: A switch design providing wide break and high interrupting capacity; a time-delay, under-voltage release, preventing shut-down on brief power disturbances and assuring that, in case of short circuits, the line protective devices will open first; contact tips of standard contactor contruction and action, reducing maintenance cost to a minimum; and cabinet construction of the case for wall mounting, with ample room for wiring connections and access to all parts.



General Electric Type CR-1034-K-33 Manually-Operated Compensator of High-Interrupting Capacity

Brown & Sharpe Rule Depth Gage

Measuring in small holes can be done by means of the rule depth gage that has been placed on the market by the Brown & Sharpe Manufacturing Company, Providence, R. I. The device illustrated is so designed that it can be used with a 4-in. or 6-in. rule, or with a $\frac{5}{64}$-in. rod for measuring the depths of small holes. The latter is convenient when the rules cannot be used.

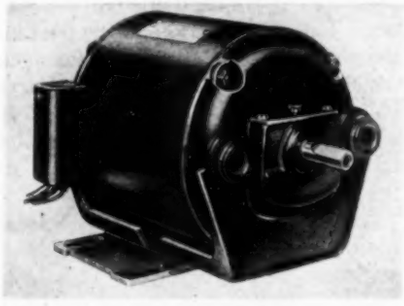
The blade of the 4-in. rule depth gage is furnished with the No. 10 graduation and the 6-in. size with either No. 10 or No. 11 graduations, English measure. The metric blade is graduated in millimeters and half-millimeters. The rod or rule is locked conveniently at any reading

Brown & Sharpe Rule Depth Gage

by a turn of the knurled nut on the base, which is about 2½ in. wide. This rule depth gage is furnished with a 4-in. rule, with or without a 4-in. rod, or with a 6-in. rule, with or without a 6-in. rod.

Wagner Type 57 RA Rubber-Mounted Motor

Rubber mounting of the type 57 RA repulsion-starting induction motor has resulted in an exceptionally quiet machine, according to the manufacturer, the Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo. The motor is completely insulated from the supporting cradle-shaped base by means of rubber bushings. In spite of the use of rubber to absorb the minimum amount of vibration produced in the motor, the entire outfit is practically



Wagner Type 57 RA Rubber-Mounted Motor

rigid, and the shaft alignment is not endangered. Moreover, the new type of mounting has been effected without a change in overall length and width.

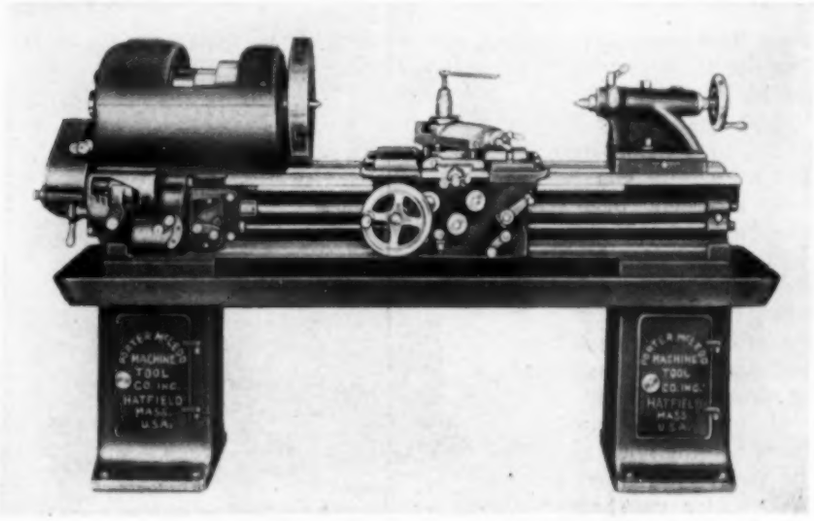
In addition to the mounting, the motor has also undergone alterations to improve quietness and electrical performance. In addition to equipping the governor weights with rubber bumpers, the rocker arm has been redesigned to minimize brush noise during starting and stopping. The power factor and efficiency have also been improved. The motor is of the brush-lifting type, the brushes being lifted off the commutator as soon as the rotor attains operating speed. This feature also insures quietness in operation and prolongs the life of the commutator and brushes.

Porter-McLeod 16-Inch, Double-Back-Geared, Screw-Cutting Lathe

FORTY different thread pitches can be cut on the standard 16-in., double-back-geared, quick-change, screw-cutting engine lathe, which has been placed on the market by the Porter-McLeod Machine Tool Company, Hatfield, Mass. These pitches range from 2 to 56 threads per in., and the largest diameter that can be held in the split chuck is 1 in. The swing over the carriage is 10 in., and the distance between the centers, when a 6-ft. bed is furnished, is 33 in. Lathes can also be furnished with 5-, 7-, 8-, and 10-ft. beds.

The headstock is of full box section with internal ribbing, and the spindle bearings are of large size. They can be furnished either in a special bronze or with Timken roller bearings. The spindle is of chrome-nickel steel, forged and bored from the solid with a 1⅝-in. hole throughout, and is heat-treated. The spindle nose is 2⅞ in. in diam., and the pilot is ⅛ in. greater in diam. than the threaded portion and ⅞ in. long, with a shoulder 3⅞ in. in diam. next to the bearing. These features insure accuracy and interchangeability when fixtures are mounted on the faceplate for manufacturing purposes, and insure rigidity for chucks and faceplates. The tailstock is of the cut-away pattern, and the tail spindle is 2 in. in diameter.

The apron has been entirely redesigned. It has double walls, and is arranged so that all the gears run in an oil bath. Friction devices are provided for both the longitudinal and cross feeds, and the half nuts are of cast iron, chased and scraped into a housing. They are provided with an adjustable positive stop to prevent pinching of the lead screw, this feature insuring accurate chasing. A positive lock is provided through the apron gears, so that feeds cannot be thrown in when the half-nut is engaged. One revolution of the apron handwheel moves the carriage 1 in., a dial graduated in 1/128 in. and stamped to read in eighths is provided on the handwheel, so that a cut can be made to any desired length without measuring the work. Similar dials on the cross feed and compound-rest feed read to 0.001 in. The power feed pinions, forward and reverse, are fitted into a brass sleeve, which incloses the feed rod in such a way that no oil from the bath can come in contact with the feed rod and thus



Porter-McLeod 16-Inch, Double-Back-Geared, Quick-Change, Screw-Cutting Engine Lathe

leak out. A filling cup is provided on the apron for replenishing the oil supply. The compound rest has the bottom slide graduated to 90 deg., and the top slide will clear the cross screw dial in any position.

The quick-change gearbox is a unit mechanism bolted on to the bed. All the gears and clutches are steel, being made from bar stock or forgings. All gears are entirely protected from chips and dust, and all shafts are supported at both ends.

Regular equipment consists of two cabinet legs, one large and one small faceplate, one center-rest, one follow-rest, two centers of tool steel, tool-post, countershaft and wrenches. The weight on skids is 2,100 pounds.

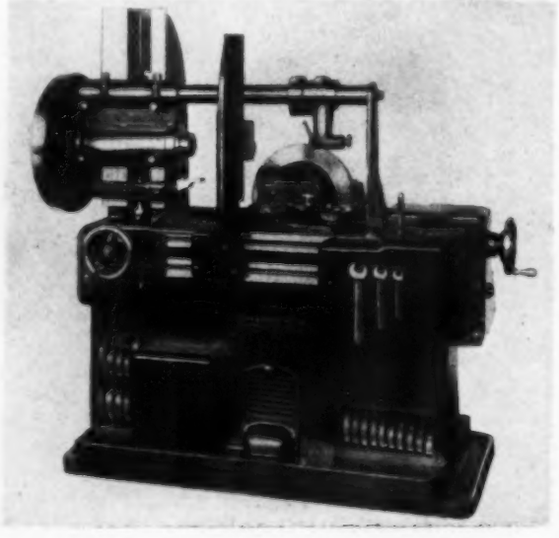
A 13-in. size is also manufactured.

Brown & Sharpe Improved No. 3 Automatic Gear-Cutting Machine

INCREASED range and a positive drive that eliminates any tendency for backlash are among the improvements incorporated in the No. 3 automatic gear cutting machine manufactured by the Brown & Sharpe Manufacturing Company, Providence, R. I. The capacity of the machine has been increased to cut gears up to 4 D.P. in cast iron and 5 D.P. in steel, and to handle work up to 36 in. in diam. by 11 in. face. Economical cutting of small gears and other parts with narrow faces is facilitated by giving a shorter minimum stroke of ½ in. to the cutter slide. The machine is suitable for cutting gears, sprockets, splined shafts, for milling the teeth of cutting tools, and for numerous milling jobs where automatic indexing is a desirable feature.

The motor is now mounted in a compartment in the base, and is completely inclosed, but readily accessible for oiling and adjustment. Power is transmitted from the motor to the machine by means of a silent chain and sprocket. The unit, however, can be belt driven, if desired, from an overhead countershaft. The work spindle and slide are held positively against the upright ways at four points, two surfaces taking the direct cutter pressure. The slide is held against the ways by means of two tapered gibs, and this direct bearing adds to the rigidity on heavy cuts. The cutter spindle is driven by means of a bronze driving gear from a worm sliding on a multiple-splined horizontal driving shaft, thus assuring a positive drive and eliminating backlash.

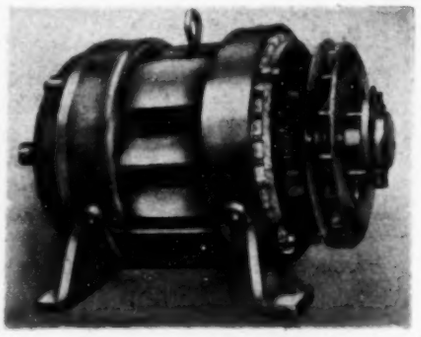
The oiling system has been simplified and improved, effecting a material reduction in the time required for oiling, according to the manufacturer.



Brown & Sharpe Improved No. 3 Automatic Gear Cutting Machine

Westinghouse Type CS Totally-Inclosed, Fan-Cooled, Squirrel-Cage Motor

Designed for use in locations where the dirt conditions are too severe for the ordinary standard open motor, this Type CS totally-inclosed, fan-cooled, squirrel-cage motor has been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. An important feature of this line of motors is that their size is approximately the same as that of a standard open motor of equivalent rating.



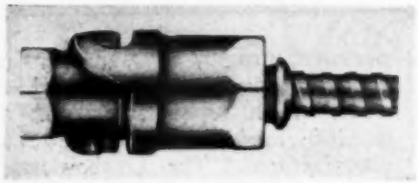
View of the interior construction of the Westinghouse Type CS Totally-Inclosed Fan-Cooled Motor

In construction, these motors are almost identical to that of the standard open motor. The stators differ only in that the ends of the windings are inclosed in sturdy, sheet-metal, protective housings. The rotors are identical except for the addition of a machined steel collar mounted on either end of the shaft. These collars serve as supports for the external cooling fans. The external cooling fans draw air through the brackets at either end and, after directing it over the entire outside surface of the protective housing, discharge it through the middle section. This construction makes possible the use of short, direct air passages, which allow ready passage for large volumes of cooling air. The clean air sealed in the interior of the motor is kept in circulation by blowers on the ends of the rotor.

These fan-cooled, totally-inclosed motors are supplied equipped with standard ball bearings. This construction is essential due to the minimum amount of end-play allowable. These motors use the same control as any standard squirrel-cage induction motor, and may be started at reduced voltage by the "Auto-starter," or across full-line voltage by the "Line-starter."

Robinson "Midget" Plain Air Hose Coupling

A one-quarter turn disconnects the air hose coupling that has been placed on the market by the Robinson Machine Company, Muskegon, Mich. The device illustrated has no



Robinson "Midget" Plain Air Hose Coupling

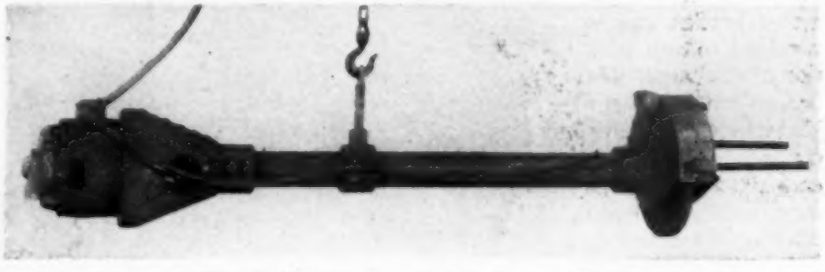
springs or loose parts to wear or break. A special leather gasket, which is not affected by oil or other air line substances, is used. It is claimed to outwear the common rubber gasket provided ordinarily. The gasket is expanded by a V-shaped sliding ring, when the pressure is applied. A nut adjustment makes compensation for wear possible.

The coupling does not contain company's automatic check valve feature. The weight of the device is less than 8 oz., and it is 1 in. in diam. The coupling with the hose shank is $3\frac{1}{2}$ in. in overall length. It is made interchangeably in $\frac{1}{4}$-in. and $\frac{3}{8}$-in. sizes for pipe and hose lines. All couplings are tested at an air pressure of 100 lb. per sq.in.. It is said that the device is suitable for paint-spraying equipment or for use on other apparatus where quick changes are necessary.

Kinney Ball-Bearing Swing-Frame Grinder

Simple and sturdy design is the feature of the swing-frame grinder, which has been placed on the market by the Kinney Iron Works, Los Angeles, Calif. The machine is especially adapted for snagging, oil-tool dressing, and rail and frog grinding. The motor is connected directly to the wheel through a flexible coupling and heavy shaft. Both ends of the shaft are mounted in heavy ball bearings in dust-proof housings. The motor is suitable for either two or three-phase operation on 220 or 440 volts. It is also equipped with ball bearings.

The wheel guard may be rotated easily so that either side of the wheel is exposed. The grinder is suspended by a sliding collar, which permits balancing the machine as the wheel wears. Only 30 sec. is required to remove the wheel. The maximum wheel size that can be used with the 5-hp. model is 18x3 in., while a 24x3-in. wheel can be used on the 10-hp. model. The overall length without the handle is 7 ft. 9 inches.

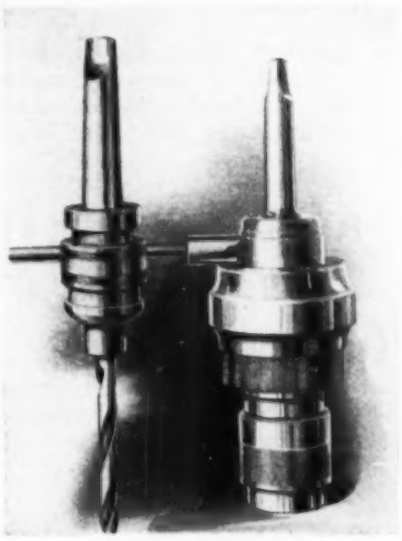


Kinney Ball-Bearing Swing-Frame Grinder

Jarvis Style P Quick-Change Chucks and Collets

Where two operations, or, in fact, any number of operations such as drilling, reaming, counterboring, spot facing and tapping are required in one setting of the casting, these Style P quick-change collets and chucks can be used to advantage on a radial drill or ordinary drilling machine. A common engine lathe can be converted to a turret lathe by means of these devices, a spring being placed in the back of the locking ring of the chuck to hold it locked in the horizontal position. These collets or chucks have been introduced by the Charles L. Jarvis Company, Gildersleeve, Conn. Both types are shown in the accompanying illustration.

The collets holding various tools can be changed quickly with one hand, leaving the other hand free to operate the machine and locate the work on the machine table. They are made short, thus bringing the chuck nearer the work, while holding the tool rigidly. The collets are made of drop forgings hardened and ground, and are available in all standard drill and tap sizes. The chucks are made in four sizes known

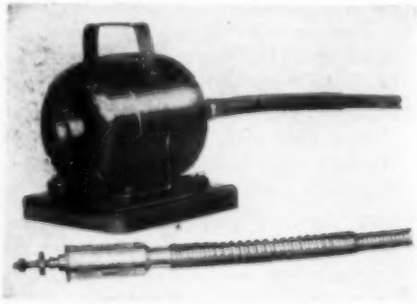


Jarvis Stype P Quick-Change Chuck and Collet

as Nos. 2, $2\frac{1}{2}$, 3, and 4, their largest diameters being 2, $2\frac{5}{8}$, 3, and $4\frac{9}{16}$ in., respectively. Other features are that driving is accomplished by means of lugs placed near the work, and that each collet is supplied with a guard.

Peerless Flexible Shaft Grinder

Three types of mountings are provided for the flexible-shaft grinder, which has been placed on the market by the Peerless Electric Company, Warren, Ohio. These are a pedestal mounting, a trolley mounting for overhead monorail service, and a portable-type bolted to a plate. The flexible shaft is driven by a $\frac{1}{2}$-hp. motor suitable for operation on 110- or 220-volt, 60-cycle circuits. The



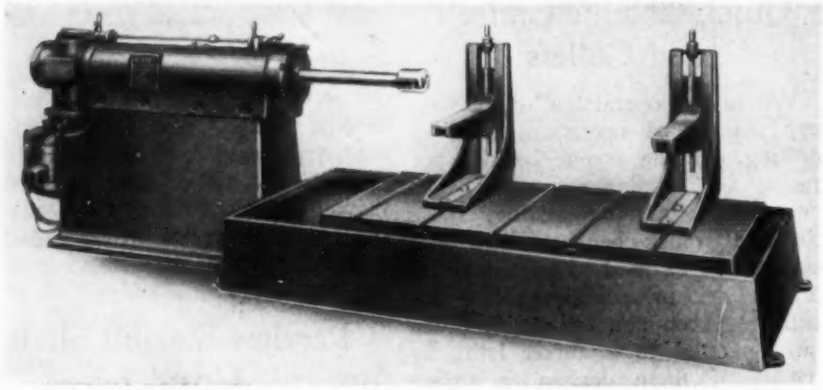
Peerless Portable Flexible-Shaft Grinder

motor can also be furnished for other voltages and frequencies. The motor speed is 1,750 r.p.m., but it can be furnished for operation at 3,500 r.p.m. The length of the flexible

cord is 6 ft., and it may be used to drive grinding wheels, sanding wheels, wire brushes, buffing wheels, rasps, and taper pins. The largest grinding wheel that can be carried is 5x¾x⅝ in. Shipping weights of the portable and trolley types are 75 lb., and 200 lb. for the pedestal type.

Hutto Model MJ, Horizontal, Heavy-Duty Cylinder Grinding Machine

CYLINDERS ranging from 3 to 12 in. in diam. and up to 55 in. in length may be ground straight and round within the commercial limits on the inner surfaces, and with any desired finish, by means of a Hutto grinder in combination with the model MJ horizontal, heavy-duty grinding machine illustrated. The grinding machine has been developed by the Hutto Engineering Company, Inc., 515 Lycaste Ave., Detroit, Mich. Its spindle speed may be set at 100, 150, or 200 r.p.m., and the reciprocating speed may be 50, 75, or 100 cycles per min. at a travel of 4 in. The machine is equipped with a 7½-hp. motor, operating at 1,800 r.p.m., and a ¼-hp. motor is used to drive the kerosene circulating pump.



Hutto Model MJ, Horizontal, Heavy-Duty, Cylinder Grinding Machine

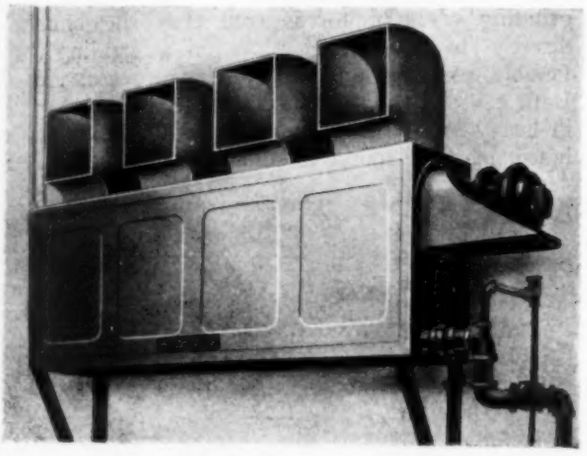
Buffalo "Lowboy" and "Highboy" Unit Industrial Heaters

Positive circulation of heated air is assured by the use of the "Lowboy" and "Highboy" unit industrial heaters manufactured by the Buffalo Forge Company, P. O. Box 985, Buffalo, N. Y. The Lowboy and Highboy are similar in design except that the Highboy has two sections of heating elements. Each type can be installed vertically, horizontally, or inverted, and each is suitable for floor mounting, wall bracket mounting, or for ceiling suspension.

As will be noted in the illustration, the heater has four units, each unit having its own fan housing designed to deliver a large quantity of air quietly and efficiently. The multirotors are of the centrifugal type

The heating elements are built up of "Universal Aerofin" tubing suitable for pressures from 2½ to 150 lb. per sq.in. This heater element can be removed through the end plate at either end of the unit.

The motor bracket end plate and the outboard end plate are interchangeable so that the drive can be placed on either end. The motor bracket can be revolved to any position of discharge. The heater can be assembled with steam or drip connections on either end as desired. It drains properly whether mounted in an upright or horizontal position. When mounted upright, the Highboy has an overall height of 90 in. and extreme width is variable from 61 to 100 in., for the three sizes manufactured. The Lowboy has a height of 60 in. overall, the other dimensions being the same.



Buffalo "Lowboy" Unit Industrial Heater mounted on wall brackets

Trade Publications

BEARINGS. Bearium Bearings, Inc., 261 Franklin St., Boston, Mass., has published a booklet entitled, "Common Sense About Bearings," in which it gives the physical properties of the six standard mixtures of Bearium metals. A section is devoted to the practical applications of the various grades of the metal, and curves for the running tolerances recommended for Bearium bearings of various diameters are included.

INDUSTRIAL HEATING PROCESSES. The Surface Combustion Co., 2375 Dorr St., Toledo, Ohio, has published a work entitled "Data on Industrial Heating Processes" which, because of the steady stream of inquiries for engineering and operating data, has been compiled by its engineering department. The volume is not a textbook, but rather a handbook designed especially for the engineer familiar with the subject and for the industrial gas engineer. Much effort has been expended to translate the theoretical discussions of authorities into a practical and comprehensive form suitable for use. The use of clean gas is stressed since the variables entering into heating problems when it is used are less than for any other fuel. The book is printed in loose-leaf form so that additional sheets may be included as published. It contains seven sections and several hundred pages of various data.

News of the Week

Industrial Truck Makers Organize Association

Another group is added to the list of trade associations with the announcement of the formation, as of January 1, of the Industrial Truck Association, composed of manufacturers of electric industrial trucks, tractors, storage batteries and accessory equipment. The association is a development of the co-operative sales promotion activity which these manufacturers have conducted for the past three years through the Society for Electric Development, Inc. The new association headquarters are located at 52 Vanderbilt Ave., New York City, with C. B. Crockett in charge as secretary.

Supported by initial membership from fourteen companies producing over 90 per cent of the products of the industry, the association has for its purpose the broadening of present markets, education of the public and the solution of materials handling problems by the use of mechanical equipment. The founders of the association also see an opportunity for further simplification and standardization of their product and a free exchange of statistical information.

M. S. Towson, president of the Elwell-Parker Electric Co., is the president of the association; E. J. Bartlett, president of the Baker-Raulang Co., and W. C. Allen, president of the Yale & Towne Manufacturing Co., are vice-presidents; and G. A. Freeman, president of the Automatic Transportation Co., is treasurer.

Initial membership in the association includes the following companies:

Automatic Transportation Co., Inc., Buffalo, N. Y.
Baker-Raulang Co., Cleveland, Ohio
Crescent Truck Co., Lebanon, Pa.
Elwell-Parker Electric Co., Cleveland, Ohio
Lakewood Engineering Co., Cleveland, Ohio
Mercury Manufacturing Co., Chicago, Ill.
Wright-Hibbard Industrial Electric Truck Co., Inc., Phelps, N. Y.
Yale & Towne Manufacturing Co., Stamford, Conn.
Edison Storage Battery Co., Orange, N. J.
Electric Storage Battery Co., Philadelphia, Pa.
Gould Storage Battery Co., Depew, N. Y.
Electric Products Co., Cleveland, Ohio
Hertner Electric Co., Cleveland, Ohio
Sangamo Electric Co., Springfield, Ill.

Screw Machine Products Association Elects

At the annual meeting of the Screw Machine Products Association, held in Chicago, Jan. 16, the following were elected directors: E. H. Pillars, of the Fostoria Screw Co., Fostoria, Ohio; Scott Osgood, of the Curtis Screw Co., Buffalo; J. W. McDonough, of the Sherman Klove Co., Chicago; and Russel G. Smith, of the F. H. Smith Manufacturing Co., Chicago. Fred H. Fischer, of the Fischer Special Manufacturing Co., Cincinnati, was elected president; Mr. Osgood, vice-president; John S. Cochran, of the Mac It Parts Co., Lancaster, Pa., secretary; and Mr. McDonough, treasurer.

The chief business of the meeting was the adoption of suggestions on cost finding methods presented in a report of Dr. Swanson, of the Swanson Ogilvie Co. This report showed present methods in 16 screw machine product plants visited, supplemented by data gathered from 68 questionnaires returned by other plants. Production, methods of costing and estimating, and various policies were discussed in the report.

Stilwell Vice-President of Warner & Swasey

At the annual meeting of the Warner & Swasey Co., Cleveland, Ohio, held Jan. 14, Charles J. Stilwell was elected a vice-president and a director of the company. Mr. Stilwell has been with the organization since his graduation from Denison University in 1910, when he began as a salesman. From 1912 to 1914, he was manager of the New York sales office. The following two years he served the company's interests abroad, returning in 1916 to become assistant to the vice-president. During the war period, Mr. Stilwell was engaged in the negotiations with and the follow up of the manufacturers associated as sub-contractors in the company's war contracts. After the War, he returned to Europe as manager of the foreign branch. When he came back to Cleveland in 1923, he was made sales manager, a position he has held to date.

Charles J. Stilwell
Vice-President
The Warner & Swasey Co.

William J. Burger, works manager, was also elected a director at the same meeting of the board. He began his apprenticeship with the company in 1899, and has held the positions of chief inspector, head of the sales engineering department, assistant superintendent, and production engineer. In 1924, he became works manager.

Russia to Spend Huge Sums for Machinery

According to Saul G. Bron, chairman of the board of the Amtorg Trading Corporation, New York, one billion dollars will be spent by the Russian Soviet Government in 1929 for industrial and electrical expansion in Russia. Part of this expenditure will go for machinery to equip a new $17,500,000 tractor plant, which is expected to turn out 20,000 tractors yearly. The Russian Government has estimated that 220,000 tractors will be needed there for agricultural purposes in the next ten years. Other large plants are to be constructed to make automotive equipment for the 15,000,000 acres of State farms which the government expects to have under cultivation within five years.

Large sums will be spent this year in the United States by the Russian Government for mechanical equipment and engineering advice, it was announced by the agents of the Russian government in this country. Last year's machinery exports to Russia were above $80,000,000, and this year it is predicted that exports of this type will be even better.

Simonds Economic Awards

The first prize of $1,000 of the sixth annual Alvan T. Simonds economic contest was awarded to Prof. Henry F. Walradt, of Ohio State University. The subject was "Who Ultimately Pays the Taxes?" The second prize of $500 went to William J. Shultz, financial economist of the National Industrial Conference Board, New York. Honorable mention was given to Harold Cunningham, of Montreal. The judges were Channing H. Cox, ex-governor of Massachusetts, and John G. Thompson, assistant to the president of the Simonds Saw and Steel Company. The contest aroused much interest, and many essays were submitted.

Anticipate Merger of Southern Machine Shops

A merger between the Joubert & Goslin Machine & Foundry Co. and the Birmingham Machine & Foundry Co., both of Birmingham, Ala., involving $2,000,000, has been agreed upon by members of the board of both concerns, it was recently announced. Officers of both companies admitted that the merger had been agreed to, but refused to state if any official action has been taken. According to reports, W. H. Hassinger is to be chairman of the merged companies, with Julius Goslin as president in charge of sales. It is said that George Morrow will be vice-president in charge of operations. What name will be given the new company formed by the merging of these two old companies could not be learned.

Simplified Practice Acceptances

That the simplified practice recommendations of the Department of Commerce are being followed out to an encouraging degree was brought out as a result of a recent survey. Twenty-four recommendations were reviewed during 1928, and it was found on the average 87 per cent of the articles covered conformed to the program laid down by the department. Each year finds a better degree of conformance, although the Division of Simplified Practice has no regulatory or "police" power to force manufacturers to observe the adopted program.

One interesting fact brought out by the survey was the reported saving of $225,000 in inventory, or $13,000 savings in interest charges thereon, by an Eastern manufacturer of self-opening dieheads. The simplified practice recommendation for this commodity reduced the varieties by 75 per cent.

Midwest Power Exhibit

Approximately 300 manufacturing companies will exhibit at the fourth Midwestern Engineering and Power Exposition to be held in the Coliseum, Chicago, Feb. 12-16. Simultaneously at the Palmer House the Midwest Engineering Conference will be held. Most of the subjects to be discussed relate to power plants.

When Ford Buys

Two large parts orders from the Ford Motor Car Co. were noted recently. One was for 100,000 piston rings a day to supply the requirements of present Model T cars, of which it is estimated that about eight million are still in operation. The Muskegon Piston Ring Co. received the order, the largest received by any one company in the industry. The other large order was for a million generators to be supplied by the Electric Auto-Lite Co. during this year. Starting at 1,000 units a daily production of 4,000 a day is to be reached.

An order for 300-400 motor block castings a day for Model T cars was received by the Lakey Foundry & Machine Co., Muskegon, Mich., a subsidiary of the Continental Motor Co.

Aeronautical Industry Continues to Expand

The Kinner Airplane & Motor Corporation is now completely installed in a new plant located at 635 West Colorado Blvd., Glendale, Calif. The plant, including test houses, covers approximately 2½ acres, and is equipped with improved types of machinery, tools and equipment for producing airplane motors on a quantity basis. The company is concentrating on the production of a 5-cylinder radial type of 100 hp. Present production is 30 motors per month, but indications are that this will be doubled by the end of March. N. N. Tilley, formerly chief engineer of McCook Field, Dayton, Ohio, is now chief engineer of the Kinner company.

The Pratt & Whitney Aircraft Co., Hartford, Conn., maker of radial air-cooled engines, has announced the formation of a Canadian branch, to be known as the Pratt & Whitney Aircraft Co., Ltd. Part of the plant of the Charles Walmsley Co., Longueil, near Montreal, has been leased and production is to start in February. The president of the branch is James Young, of Montreal.

On top of the announcement that Caproni planes were to be made in this country, comes the news that Isotta-Fraschini airplane motors are to be made in the United States, according to Enea Bosai, American licensee for the Italian company, and president of the American Aeronautical Corporation, New York, N. Y. All types of engines from 80 to 1,000 hp. will be made.

The United Aircraft & Transport Corporation, the name to be adopted by Boeing Airplane & Transport Co., has acquired the Hamilton Aero Manufacturing Co. and the Hamilton Metalplane Co., both of Milwaukee. The manufacturing company is one of the largest manufacturers of aircraft propellers in the United States.

Another airplane company was recently formed in Chicago. It is known as Illinois Aero Motors, Inc., 3418 Irving Park Blvd., and was formed to manufacture and deal in airplanes and aircraft. William R. Rudd, Alfred Broady and Chester Williams are the incorporators. Capital is 1,000 shares of common stock, non-par value.

The Great Lakes Aircraft Corporation has received an order from the Goodyear Tire & Rubber Co. to do the duraluminum work on the two Zeppelins now being built by Goodyear for the Navy Department.

Various Trade Indices

Corrected totals for automotive production in 1928 indicate that 3,826,613 passenger cars, or 29.9 per cent greater than in 1927, were produced, and 530,771 trucks, or 16.7 per cent larger than the previous year.

The index for foundry equipment orders stood at 166.5 in December, compared with 197.8 in November and with 106.8 for December, 1927.

Class I railroads in 1928 installed in service 58,395 freight cars, a reduction of 16,991 cars as compared with the number installed in 1927, and of 45,605 as compared with the number in 1926.

New orders for steel castings in December was for 65 per cent of shop capacity, as compared with 58 per cent in November and 54 per cent a year ago. The total production for 1928 was 147,400 tons, against 144,800 a year ago.

Regular shipments of electric industrial trucks in December was 152, as compared with 132 in November and with 96 of December, 1927. The year's total was 1,465 as compared to 1,259 in 1927.

The total apparent consumption of babbitt metal was 59,676,765 lb. in 1928, as compared with 60,111,843 lb. in 1927.

Orders received by the General Electric Co., Schenectady, N. Y., amounted to $348,848,512 in 1928, representing an increase of 13 per cent over the amount for the previous year.

According to data collected at the biennial census of manufacturers taken in 1928, the establishments engaged primarily in the manufacture of cutlery (not including silver and plated cutlery) and edge tools in 1927 reported products valued at $76,688,444, a decrease of 4.5 per cent as compared with $80,263,252 for 1925, the last preceding census year. The production of edge tools showed a slight gain, however, of 1.7 per cent.

German Locomotive Firms Consolidate

The general movement in Germany toward industrial consolidation has appeared also in the German locomotive industry, Vice Counsul C. T. Zawadzki, Munich, says in a report made public by the Department of Commerce. The Lokomotivfabrik J. A. Maffei Aktiengellschaft, of Munich, has arranged a consolidation of interests with the Lokomotivefabrick Henschel and Sohn G.m. b.H. of Kassel, with the object of regulating competition.

German Machinery Building Industry Experienced a Good Year

By Our Berlin Correspondent

ALL in all the year 1928 has been a successful one for the German machine building industry. It has decidedly made some considerable strides toward prosperity, although the picture it presents loses some of its outward brilliancy on close observation. The predominant feature of the year was a very notable progress of the efficiency movement, which got such a strong hold upon the spirit of the German engineering world that it has become the watchword of the day. Some excellent results have been obtained by the continuous production process (in which is seen the acme of efficiency) in both small and large shops. Judging by the development of the past year, it may be safely predicted that in a few years hence the continuous process will be installed in every shop producing quantity work.

In previous years German manufacturers and engineers have traveled a good deal in the world to establish close connections elsewhere and some results of this policy have become visible during the past year, not in the "mere copying" line, which is at a discount now more or less, but by endeavors toward improvement and adaptation. Much of the backwardness of previous years has been stamped out, as can be best seen in the typical cases of the German motor car manufacturing industry and of the German machine building industry, which are on a fair way to becoming again closely linked with the world's progress.

Naturally, this development was strongly reflected in the increased consumptive power of the home market. During the first half of 1928 the percentage of machinery production supplied to the home market was unusually large, and only in the second half did exports recover something of their normal proportion. It is also seen in the growth of machinery imports, which in the period, January-October, 1928 (the returns of the two last months of 1928 were not available at the time of writing), totaled 60,204 tons, as against 47,797 in 1927 and 28,945 in 1926. Machinery exports have grown considerably too, amounting in the first ten months of the year to 445,783 tons, as compared with 367,890 and 332,240 tons in the corresponding periods of 1927 and 1926. The two former figures contain the reparation supply of machinery. In 1927 it was 20,608 tons and in 1928, 14,866. The drop is due to large railway engine supplies in 1927, which inflated the figure. All in all, the reparation supply is growing but slowly and slightly. As can be seen from the above figures it amounts to only a fraction of the total German machinery export and the part it plays in it is insignificant.

Periods Compared

In the accompanying table is seen the export and import of the chief classifications of machinery in the first ten months of the last three years. The figures plainly show a sound progress of domestic business, reflected in the increased import, as well as foreign business, particularly since the increase is fairly well distributed over all classes of machinery. The reparation supply, which gives an inkling of the categories of machinery in demand by the reparation countries, is attached to it. In view of the facilities extended to buyers on reparation account in many countries, such as France, the small results are astonishing and very unpromising as regards the future of this business.

The financial situation of German manufacturers is by no means rosy yet, although it has improved somewhat. This improvement is, however, not so much due to an accumulation of capital as to greater facilities for obtaining credit. The apparent prosperity of many German works, often the largest, rests frequently upon the unstable foundation of money borrowed at large interest rates, which together with taxes, labor welfare expenditures and other levies, is consuming a large part of the profits made, so that new capital is very slow in materializing. The tightness of money is best seen in the long terms of payment demanded and the difficulties of manufacturers to meet their obligations scrupulously. The manufacturers are well aware that they could considerably increase their domestic and, particularly, their export business by granting credit facilities, but they are unable to do it, with a rate of interest exacted by their banks of 10 per cent and more. Here is where they are decidedly beaten by their foreign brethren, and where they cannot compete with them on equal terms for some time to come.

The second great problem that German machinery manufacturers have to face is the labor situation. The ruling procedure has developed in a very unsatisfactory way, tending to an unbroken upward movement of wages. The trade unions which are fostering this movement as a matter of principle and could not now reverse or slacken the motion, even if they wanted to, have become exceedingly strong and are ranking, as regards political influence, far above the whole manufacturing community. In this way the part of impartial arbiter in labor conflicts, assigned to the government, has become rather doubtful. The inherent conflict, which may be regarded as a lingering disease, has matured a great deal during the past year and is approaching a critical stage. The recent huge labor conflict in Germany's industrial center is generally considered a forerunner of more serious trouble still to come and it may well be that the year 1929 will be filled with a good deal of untoward events for German machine builders who hold an advance post in labor matters.

German Imports and Exports for Corresponding 10-Month Periods

	Import in Tons, January–October			Export in Tons, January–October		
	1928	1927	1926	1928	1927	1926
Railroad engines	193	293	360	24,889	27,477	20,258
Tractors	3,362	3,097	1,179	5,256	1,704	1,278
Power generating machinery	9,098	4,650	468	36,345	33,002	23,086
Textile machinery	21,775	19,110	12,710	63,215	50,209	47,946
Machine tools	4,065	3,721	2,132	59,387	50,772	50,476
Woodworking machinery	706	500	222	9,335	7,724	7,717
Presses, hammers, etc.	100	110	80	4,077	2,603	2,176
Agricultural machinery	8,097	6,285	3,788	38,004	40,003	45,370
Paper machinery	186	52	111	16,114	8,813	6,687
Pumps	446	292	225	10,634	7,208	6,348
Ore dressing machinery	155	139	39	7,229	5,402	4,027
Ceramic machinery	1,550	1,480	815	12,357	10,044	6,242
Printing presses	974	940	618	13,533	10,217	9,181
Reparation Supply						
Railroad engines				616	8,203	
Power generating machinery				1,036	479	
Textile machinery				4,685	3,086	
Machine tools				2,126	3,065	
Woodworking machinery				97	121	
Presses, hammers, etc.				238	11	
Agricultural machinery				1,021	1,576	
Paper machinery				1,515	265	
Pumps				372	75	
Ore dressing machinery				641	307	
Ceramic machinery				125	587	
Printing presses				54	126	
Sundry				2,330	2,707	

Malleable Iron Tonnage Fell in 1927

The Department of Commerce announces that, according to data collected at the biennial census of manufactures taken in 1928, commercial foundries produced 585,616 short tons of malleable-iron castings for sale as such, valued at $81,064,855, in 1927, representing decreases of 17.8 per cent in tonnage and 20 per cent in value as compared with 712,499 short tons, valued at $101,348,758, produced in 1925, the last preceding census year.

BUSINESS BAROMETER . . . . *As half of a "business boom" is present, it is not unlikely that the other half will follow in due course*

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

FOR a slogan to express the philosophy that now dominates business, I suggest that Richelieu's declaration, "In the lexicon of youth . . . there is no such word as fail," be paraphrased to read, "In the lexicon of American business there is no such word as depression." The stock price averages reveal that the market during the last two or three weeks has advanced into new high ground with but few intervals of hesitation, and most of the other indices of business show that activity is unchecked and confidence unimpaired.

Brokers' loans are up another $48,000,000 and acceptances are higher. There is no sign that the inflationary movement, which has the country in its grip, is losing momentum, and the announcement that two shipments of gold totaling $7,500,000 have been started to the United States from Great Britain is likely to give it a fresh impetus.

It is true that the amount is not large and that the credit that can be extended upon this gold as a base will total, at the average rate of multiplication, less than $100,000,000. But gold imports are always stimulating, as they find their way immediately into the Reserve Banks, where they either reduce member bank's borrowings or add to their reserves. And unless further shipments are averted, possibly by an advance in the London bank rate, they may fan the flame of speculation afresh, and cause it to break out in the markets that hitherto have seemed to be fireproof.

It is interesting to exhume from the economics of what many now consider a bygone era a statement of the business conditions that were thought to foretell an impending crisis or depression. They are: high prices, increased activity of business and the formation of new enterprises, active demand for loans, increasing wages, increasing extravagance in expenditure, a mania for speculation, expansion of bank credit at rising interest rates, and strikes and labor shortage.

As every observer will admit, some of these conditions are now present. Business is active though its activity is not spread equally through all industries. Mergers and the expansion of existing organizations have replaced largely the formation of new enterprises, but the effect in the inflationary scheme is the same. On the mania for speculation and the active demand for credit at rising interest rates, it is unnecessary to dwell. And while "extravagance" is a term hard to define, it ought to include the greatly increased rate of obsolescence that is accepted for everything from clothes to skyscrapers, as well as the sale of "shoes, ships and sealing wax," on the installment plan.

On the other side of the picture where wage increases are being granted, they are being largely offset by the greater use of machinery and higher efficiency in management and production. Strikes and labor shortage are notably absent and, most important of all, commodity prices are not high. Therefore even those who still believe that a depression must follow, when all the conditions set forth above are present, have no fear that any trouble is immediately ahead, and, if the stock market be ignored as a local infection, it is easy to agree with them. Hence no fear of a crisis is apparent, and only a few expect any recession that may develop to be severe. But no long distance prophecy will be attempted. The inability to foretell the distant future is often irksome, but it is a wise provision without which faith would be weakened and hope destroyed.

This article will go no further than to suggest that, as half of a "business boom" is present, it is not unlikely that the other half will follow in the usual course of events. A condition of inflation exists, which thus far has been localized in a few real estate extravaganzas and in the securities markets. Unless all precedents fail, it will eventually overflow its present boundaries and flood the commodity markets as well, before the correctives that will be necessary to check it can be set in force.

The ultimate effect of commodity market inflation would be depression, but that is no guarantee that an advance in prices can be avoided, and, if it comes, business will be stimulated by it, and insensitive to its dangers until the climax is reached. The upward movement of rubber was resumed last week without much reason and without the support of the tire manufacturers, and, evidently, some elevating force, which is not easily analyzed, is at work. Another markup has brought the price of copper to 17 cents, the highest in five years. If commodities are indeed to turn upward, the effect undoubtedly will be to stimulate business activity and to add to the earnings of those who have become discouraged with "profitless prosperity."

From the industries, reports are generally cheerful. The automobile manufacturers are turning out nearly a record number of cars this month, and they say their sales justify a continued high production. Steel output is maintained at its high level, scrap prices are strong, and market reports indicate complete satisfaction. Therefore even those who view the stock market with alarm are otherwise optimistic, at least until some evidence comes to hand that higher money rates are laying a deadening hand on enterprise.

DEMAND for machine tools continues at a high level throughout the country, and it appears that January sales will be equal to if not better than those of December. More than ever orders for single tools predominate. In New England, for example, the greatest volume of orders for single tools on record is expected this month from indications in the past week. About the only large orders are coming from the automotive builders, and while centers like Cincinnati, Milwaukee and New England report much activity from them, dealers in Detroit on the other hand report that there was a noticeable let-up in the machine tool trade in the past week. With big expansion plans under way, however, it is felt that this condition is merely the lull before the storm of orders anticipated in the near future.

TWO WEEKS ago conditions in the Cleveland market were spotty, but since that time orders held in abeyance have begun to materialize, and the machine tool builders are again finding it difficult to keep up with deliveries. As in many other centers, there is a scarcity of skilled machinists, and an effort is being made to attract workers from other cities. In Milwaukee, too, the shops are getting further behind on deliveries. One of the features of equipment buying there in the past year has been purchases by the Chicago, Milwaukee & St. Paul R.R. shop, and it is expected to be a factor for some time. Other railroads, however, are showing little interest in shop equipment.

TENTATIVE inquiry from some of the roads in Chicago raises hopes of business from such lines there, but railroad buying elsewhere, either in fact or in anticipation, is negligible.

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The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CLEVELAND

A general pick-up in sales of machine tools was noticeable during the past ten days. Orders that were in abeyance during the holiday period are beginning to be received. Inquiries also show an increase in volume. Business conditions are expected to improve steadily for the next two months. The automotive industry is responsible for a considerable portion of this new business. The tools purchased were mostly of the high-production type.

The automatic line is well booked with orders for the first quarter. Night shifts are being used to increase production.

The scarcity of skilled mechanics has placed a serious drawback on local machine tool production schedules. The demand for machinists has reached such proportions that advertisements are being used in out-of-town papers to attract men to the Cleveland district. One company alone has requested 30 experienced Acme and Gridley automatic operators from the city employment office. When the required machinists are found by this firm it soon will be able to hire 500 additional laborers.

DETROIT

While general business conditions here are very good and there is every indication that things will be even better, there is a slight lull now in the machinery and machine tool trade. Dealers in this area have noted a let-up during the past week and this is more or less generally attributed to the Detroit Automobile show, which closed on the 26th. Orders for all kinds of equipment are still coming in and there are many changes either being made or contemplated in automobile and body designs. There are many expansion programs being worked out, and there is plenty of evidence that the year will be an active and a profitable one.

The small shops have not been busy this month, except insofar as they have been cleaning up old orders. The respite is being appreciated however, as most of the shops were so busy last year that they went far behind on their orders.

The predictions made in December and early in January are apparently being borne out, and there is a general atmosphere of optimism that is steadily increasing.

CINCINNATI

An excellent volume of business in the past week is reported by machine tool manufacturers in the Cincinnati district. With many concerns the sales total was larger than that of the previous week and in no case was a decrease reported.

Among the typical statements made in regard to the past week's business were several which in substance were as follows: "Although the month has not quite ended, our January sales are larger than they have been in that month since 1918," said a manufacturer of large tools. "Business was better than in the previous week and inquiries indicate that the market will continue to grow livelier," said a second manufacturer. "Our sales climbed to a still higher level the past week, a portion of the increase being due to the purchases made by manufacturers of automobiles," said a third. "We had an increased volume of sales in the week and business improved in a general way," said a fourth. "Our largest demand the past week has been from the Detroit market, but there also has been a good demand from the general market," said a fifth.

Selling agents report an increased volume of business in the week and express the opinion that there will be a gradual increase in the demand in local and adjacent territory, the principal part of which will be due to the discarding of obsolete tools.

Although the volume of business that came from the automobile field was a very important feature, this including several good-sized orders, the backbone of the market continued to be the sale of single tools and replacements to well diversified users.

Inquiries came in freely during the week, from all sections of the country, many being from the automotive field but the great majority being from general machinists located in all sections of the country.

MILWAUKEE

The demand for metal-working equipment continues good, and the first month of 1929 is confidently expected to produce a volume of business quite comparable to the best months of 1928. The extent and character of current inquiry likewise is regarded as auguring well for the immediate future. Meantime, tool manufacturers are pushing production to the utmost in order to meet as best they are able the insistent call from purchasers for quick deliveries. Some shops are worse off at this time with respect to their unfilled orders than at any time during the past year. Skilled machine shop labor is still very scarce, due to the general high rate of production in the metal trades.

Although it is true that the automobile factories, engine and parts makers and accessory manufacturers constitute the most active buying group, business is coming from virtually every other line of production. This is considered one of the most satisfactory elements in the situation and is the basis for the high hopes of the tool industry for an excellent year's business ahead.

Plans are forming for probably the most important development in years in the large Milwaukee shops of the Chicago, Milwaukee, St. Paul & Pacific railway. It is estimated that upwards of $300,000 of new equipment was installed during the past 18 months, this being almost entirely for replacements. Extensive additions are now contemplated which will require an even heavier investment in tools and other equipment. Otherwise, the railroad industry does not give promise of important increases in business for tool manufacturers.

There has been a fair demand for used tools and dealers report that the situation in this respect is moderately favorable, excepting, perhaps, in the heavier tools.

PHILADELPHIA

Machinery and machine tool dealers in this market reported an increase in inquiries during the last two weeks as compared to the corresponding period of 1928, with most of the requests for information coming from substantial firms, which are expected to enter the market for early purchases.

With few exceptions the dealers and manufacturers said the early weeks of 1929 are in advance of the same period of a year ago. The sales during the last two weeks were mostly for replacements and were in single tool lots. The Stokes & Smith Co. purchased nine machines during the past fortnight and some equipment was sent from Philadelphia to the Spicer Manufacturing Co. in Pottstown, Pa.

Industrial conditions generally throughout the market appear to be healthy. Some of the shops are operating up to 60 or 70 per cent of capacity with indications that employment will continue steady. The American Steel Foundries Co., of Chicago, is planning the construction of a $10,000,000 plant for the manufacture of steel castings on a tract of 120 acres adjoining the new Baldwin Locomotive Works plant at Eddystone, Pa. The Steel Foundries Co. and the Baldwin interests have joined in the formation of a new corporation to operate the plant. The Chicago company also manufactures car wheels. R. P. Lamont, president, said its present plant capacity is inadequate, but no new financing will be necessary.

NEW ENGLAND

Manufacturers of machinery and machine tools have completed another busy week. The New England section continues to show a good steady distribution of orders for single tools, many for immediate use. Delivery is an important factor in connection with new lists for production units. All through the territory there is a particularly fine demand for all manner of lathes and grinding machinery. Milling equipment has been a prominent feature among inquiries noted, and is selling strongly to the automobile accessory manufacturing industry. Buying from the automotive industry as a whole has increased steadily through the month.

The trade reports a satisfactory month with production and orders received running in excess of January, 1928. The month to date has developed no outstanding large lists, but inquiry has been steady and from a more diversified list of buyers than was noted last January. Some manufacturers report that this month will show the greatest volume of orders for single tools on record.

The steel industry has become a more prominent factor in the New England market, while the railroad industry is more or less a negligible factor, although there are rumors that one New England road is to release a list of tools. Electrical manufacturers, with particular reference to those producing electric refrigerators, heating and cooking equipment, and labor-saving devices, and the like are planning a big year, and a program of strong buying. Textile machinery is getting away to a far better start than a year ago.

CHICAGO

Practically no change in the business situation as affecting the machine tool industry is reported for the last week. The volume of trade continues on a high level, in some instances the indications pointing to an increase compared with that of December. Inquiries are coming steadily from all sources and territories in the Midwest. Employees of machinery houses, especially such as are connected with the selling end of the business, are working to their capacity to handle incoming inquiries and take care of details connected with orders and deliveries. No large buying is reported, the demand being chiefly for small lots and single tools of standard make, several for heavy-duty purposes.

At the present time, general industry is the chief factor in the market. Additional railroads to those reported are making

tentative inquiry for shop equipment, among these being the Burlington and the Northern Pacific. It is believed by those concerns that cater specially to railroad buying that within a few weeks some really substantial lists will be issued.

NEW YORK

From present indications, January ought to be an excellent month as far as machinery sales go, according to statements made by dealers and factory representatives. Those who have not received a large number of orders to date state that they seldom had so many live prospects to work upon as at this time. Some of these prospective orders involve as many as twenty machines, although the character of the market for some time has been the purchase of single items. Much of this prospective business is expected to materialize in orders before the month is out. In fact, the year is starting off with the trade in a most optimistic frame of mind.

Among the firms mentioned as buyers of shop equipment in the past week were: the Otis Elevator Co., the Elevator Supply Co., the General Electric Co., the Street Cleaning Department of the City of New York (pipe threading machines), and the Navy Department. No sales were reported to either R. Hoe & Co. or the Wright Aeronautical Co., but further purchases from both are anticipated.

There are few prospects of any extensive buying on the part of the railroads having headquarters in New York. In fact, it is said that the program of shop purchases by the New York Central, the leading road as far as tool sales go, anticipates fewer machines than was the case in 1928, a year that was not up to the usual expenditures of this road. Most of the equipment will be bought for modernizing round-house shops.

Sales made by the Pratt & Whitney Co. in the past week included: seven lathes, one surface grinder, a bench miller, two vertical shapers, a drill, two jig borers, and two die sinkers. The Niles Tool Works Co. sold a steam hammer.

Sales made by the Triplex Machine Tool Co. in the past fortnight included: three Springfield lathes, three Swiss jig borers, five Campbell nibblers, four bench drill presses, two Triplex combination machines, one "General" flexible press, and a power pipe machine.

Business Items

Announcement has been made of investment of $500,000 in the George D. Whitcomb Co., Rochelle, Ill., locomotive manufacturer, by the Baldwin Locomotive Works, Philadelphia, and the addition of two of its representatives to the Whitcomb board of directors. Coincident with this announcement, the company announced the issuance of a new $400,000 preferred stock issue to finance its building program, now being worked out, and to provide working capital. Negotiations are under way for the acquisition of 8 acres adjacent to the present plant and building to occupy this land.

Extensive changes in the organization of the Gilbert & Barker Manufacturing Co., manufacturer of oil tanks and gasoline pumps, took effect at the beginning of the year. Charles C. Ramsdell succeeds to the office of president, held since 1912 by Robert H. McNall, of New York, and Stanley C. Hope was promoted from second vice-president to vice-president and general manager to succeed Mr. Ramsdell. P. H. Bills was advanced from assistant treasurer to treasurer, succeeding W. T. Rayner, and Howard Merkel was appointed assistant treasurer.

The Valve Manufacturing Corporation, of Columbus, Ohio, began production on January 15. The company employes about 100 men and makes a patented high-pressure flood valve using in oil refining. Enough orders are on hand to keep the plant in full capacity for several months. In fact three 8-hour shifts were put into effect as soon as the plant opened. J. B. Pierce is president of the company, John J. Klise, vice-president, and J. R. Coffman, secretary and assistant treasurer. Harry B. Redding is chief engineer. Mr. Redding was formerly employed with the Ferro Machinery & Foundry Company.

The merger of the Lakewood Engineering Co. with the Jaeger Machine Co. became a reality when the stockholders of the latter ratified all actions to accomplish the purchase of the property of the former, the stockholders of which had already given approval. Gebhard Jaeger has been elected president, and O. G. Mandt, Lion Gardiner, William B. Simpler, and Henry C. Fraas, vice-presidents. John M. Ulrich is secretary. Capitalization has been increased to 200,000 shares of no-par common stock. The Jaeger company has no funded debt.

Two new additions, each 60x120 ft., to be used for box shop and steel shop are to be erected this spring at the E. & T. Fairbanks & Co. plant, East Moline, Ill., A. C. Howard, general branch manager, announced. The new units are scheduled to be in operation by April 1. Last year the plant showed an increase in business of 30 per cent and the outlook this season is for an even greater production. The plant manufactures motor truck, wagon, produce and farm scales.

Henry Hope & Sons Co., New York, N. Y., has purchased a 10-acre tract of land in Stratford, Conn., from the Bridgeport Motor Truck Corporation. There is a 1-story brick building included with 15,000 sq.ft. of floor space, formerly occupied by the Liberty Manufacturing Co., now insolvent. The Hope company plans to manufacture window glass and steel frame sashes for which it has had a distribution plant in Bridgeport, Conn. The company is a branch of an English company.

Arrangements have been made for the merger of the Cleveland Piston & Manufacturing Co., and the Cox Tool Co. by Thompson Products, Inc., all of Cleveland, Ohio, subject to the approval of their respective stockholders. The piston company is the largest manufacturer of alloy and cast-iron pistons in United States, while the Cox company is a large manufacturer of piston pins.

The Binks Manufacturing Co. has been organized to acquire the business of the Binks Spray Co., Chicago, maker of equipment for spraying paints and lacquers, and also of water cooling systems. Neil C. Hurley, formerly chairman of the board of the Hurley Machine Co., is now president of the Binks company. M. S. Sullivan is vice-president, and J. F. Roche, formerly vice-president of the Apex Electrical Manufacturing Co., is secretary-treasurer.

The Fred Pabst Co., Milwaukee, manufacturing steel nipples and other plumbers' supplies, and controlled by the Pabst Corporation, has been purchased by Frank M. Wiedeman, second vice-president, and associates, who will continue the business as a new corporate entity, Frank Wiedeman Co., with a capitalization consisting of $150,000 preferred stock and 1,000 common shares without par value.

The Auburn Automobile Co. has purchased the plant and assets of the Central Manufacturing Co., one of its principal body sources during the last four years. The Central Manufacturing Co. plant is adjacent to the Connersville plants of Auburn and the entire properties will be consolidated, furnishing total floor space of over 1,500,000 sq.ft. and having a capacity of 250 units a day.

The Blake Specialty Co., Rock Island, Ill., which has maintained a plant at Rainbow Drive, Westfield, near Waterloo, Iowa, is transferring the branch unit to its Rock Island factory for the manufacture of plumbing specialties. The Waterloo branch was formerly the Q & S Sanitary Manufacturing Co., being merged with the Blake concern three years ago.

The Connecticut Jewel Manufacturing Co., Thomaston, Conn., manufacturer of ash trays, folding chairs, and novelties, has acquired a portion of the plant formerly owned by the Carter & Hakes Machine Co., at Winsted, Conn., and will move at once. Ernest M. Grilley is president and general manager of the company.

Control of the stock of the Galion Iron Works & Manufacturing Co., Galion, Ohio, has been acquired by the Jeffery Manufacturing Co., Columbus, Ohio. The plant will remain in operation and the product will remain road building equipment and hoisting machinery.

The Clark Transmission Co., which was recently organized by Eugene B. Clark of the Clark Equipment Co., started production on Jan. 21 in its new plant at Berrien Springs, Mich. D. A. MacIntosh is factory manager. Progressive assembly is to used.

The Trindl Corporation, Chicago, last week acquired the Woodstock (Ill.) Motor Valve Co. The Trindl concern is operating an automotive products plant in Aurora, Ill., but plans to continue the Woodstock unit also, it was announced.

Letters of incorporation have been issued to the Heckman Machine Works, 4026 West Lake St., Chicago, to manufacture and deal in goods, wares and merchandise of every class and description. Capital, $50,000. Incorporators: J. L. Heckman, W. J. Schroeder and Harold B. Rapp.

Purchase has been made by the Barnes Metal Products Co., Chicago, of 97,500 sq.ft. of land at the southeast corner of Sixteenth St. and Kilbourne Ave. The improvement consists of a one-story building containing 50,000 sq.ft. of floor space.

On and after February 1, the Philadelphia offices of the Brown & Sharpe Manufacturing Co. will be located at 1102 Elverson Building, Broad and Callowhill Streets.

The James Graham Co., New Haven, Conn., manufacturer of brass forgings, has acquired additional land on Wooster St. for factory expansion.

Personals

V. F. GRACHEV, general manager of the Krasny-Putilovetz metal works at Leningrad, accompanied by three engineers, is now in this country visiting a number of factories in connection with the preparation of projects for the expansion of the Krasny-Putilovetz Tractor Division, which is to have an annual production of 10,000 tractors and spare parts for 40,000 tractors. The Krasny-Putilovetz factory, the largest machine building works in Soviet Russia, at present has an output of 3,000 tractors a year, aside from locomotives, passenger cars, dredges, Diesel engines and textile machinery.

MILES S. POTTER, general superintendent and purchasing agent of the John Deere Tractor Co., Waterloo, Iowa, has resigned to become general manager of the heating division of the Modine Manufacturing Co., Racine, manufacturer of automobile radiators and unit heating systems. JOSEPH L. CRAMER, who has been purchasing agent at the John Deere Harvester Works, East Moline, Ill., will succeed Mr. Potter in the Waterloo plant.

JAMES H. CONNER, special representative of the superintendent of motive power and machinery of the Union Pacific unit at Omaha, Neb., has been promoted to special representative of the general superintendent for the entire system. C. W. SMITH, inspector of shop standards of the unit, has also been appointed to a corresponding position for the whole system. The headquarters of both men is at Omaha.

ROBERT B. HEPPENSTALL has been elected vice-president and assistant to the president of the Heppenstall Forge & Knife Co., Pittsburgh. B. B. WEINBERG, formerly general sales manager of the company, is now vice-president in charge of sales.

SAMUEL E. RYDER, formerly general manager of the Motometer Co. of Canada, was recently made general manager of the Canadian Metalcraft Corporation, Ltd., Windsor, Ont., a newly formed subsidiary of the Grand Rapids (Mich.) Metalcraft Corporation.

AUSTIN H. CAMPBELL, because of illness, has withdrawn from the Monarch Machinery Co., Philadelphia. Edwin H. Mack, partner in the firm, has purchased Mr. Campbell's interest, and, as sole owner, will continue the business as before under the same name.

C. A. DANA is now president of the Brown-Lipe Gear Co., of Syracuse, which was recently bought by the Spicer Manufacturing Co. C. M. KALTWASSER, is vice-president and general manager. The plant personnel is continued as before.

DR. HAIG SOLAKIAN, formerly a member of the division of metallurgy at the National Bureau of Standards, is now chief metallurgist for the Geometric Tool Co., New Haven, Conn.

C. J. C. CLARKE, formerly of the McGraw-Hill Publishing Co., has become vice-president of Wightman-Hicks, Inc., New York, industrial advertising agents.

H. A. PRATT has been made assistant general manager of Wilcox, Crittendon & Co., Middletown, Conn., maker of hardware and specialties.

G. L. REEVES, one of the officials of the Reeves Pulley Co., Columbus, Ind., has been elected president of the Columbus Chamber of Commerce.

FREDERICK CHAPIN, president of the National Acme Co., Cleveland, has been elected a director of the Cleveland Trust Company.

Obituaries

FREDERICK LINCOLN SIVYER, president of the Sivyer Steel Casting Co., Milwuakee, and of the Joliet Railway Supply Co., Joliet, Ill., was killed Jan. 22 when struck by a skidding automobile on an icy pavement. He was born in Milwaukee Dec. 23, 1879, the son of the late Frederick W. Sivyer, for many years president of the Rockford-Northwestern Malleable Iron Co. During the war Mr. Sivyer donated his services to the government and was placed in general charge of semi-steel munitions production under Herbert F. Perkins.

CHARLES DEERE VELIE, vice-president of Deere & Webber Co., Minneapolis, Minn., grandson of John Deere, and brother of W. L. Velie, president of Velie Motors Corporation, who died Oct. 24, succumbed last week in his home in Minneapolis after a year's illness, at the age of 67 years. He had been associated with the Deere interests 45 years and for 30 years was with Deere & Webber in executive positions.

WILLIAM DAVID BROWN ALEXANDER, president of the National Screw and Manufacturing Co., Cleveland, died on Jan. 24, of heart disease at the age of 70. He was one of the founders of the National Acme Co., and up until 1918 was its president. He was also the founder of several other manufacturing enterprises.

GEORGE R. KELLY, president and general manager of the R. A. Kelly Co. and vice-president of the Xenia National Bank, died at Xenia, Ohio, on Jan. 24 at the age of 58. He had been ill for more than a year. The Kelly company makes twine and rope-making machinery.

JULIUS C. OLSEN, factory manager of the Western Metal Specialties Co., Milwaukee, died suddenly in Chicago on Jan. 21 while returning from Cleveland, where he had attended the Manufacturers' Exposition in Metal Specialties. He was born in Denmark in 1885.

Forthcoming Meetings

AMERICAN MANAGEMENT ASSOCIATION. Production Executives' conference, Feb. 27-28 and Mar. 1, at the William Penn Hotel, Pittsburgh, Pa. Oscar Grothe, vice-president in charge of the production executives' division, c/o White Sewing Machine Co., Cleveland, Ohio.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Regional meeting in Knoxville, Tenn., March 21-22. Eastern spring meeting in Rochester, N. Y., week of May 13. Third national meeting of the aeronautic division, St. Louis, Mo., May 27-30. Semi-annual meeting, Salt Lake City, Utah, July 1-4. Calvin W. Rice, secretary, 29 West 39th St., New York City.

NATIONAL METAL TRADES ASSOCIATION. Convention, Hotel Drake, Chicago, April 24-25. J. E. Nyhan, national secretary, Peoples Gas Building, Chicago, Ill.

AMERICAN WELDING SOCIETY. Annual meeting, April 24-26, at the Engineering Societies Bldg., New York. M. M. Kelly, secretary, 29 West 39th St., New York.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION. Thirteenth annual meeting to be held in the Hotel Statler, Cleveland, Ohio, May 16-18. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, June 24-28, at the Chalfonte-Haddon Hall, Atlantic City, N. J. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

The Weekly Price Guide

Rise and Fall of the Market

PIG IRON, the basic material of the metal industries, is selling actively but in small lots. Iron prices remain steady with a slight tendency upward due to an average rise of $1.25 per ton on scrap, which occurred during the last week. Finished steel is being taken in large quantities by the railroads. Bars, sheets, strips and plates are by far the most active items; prices of these remain firm. Gray-iron machinery castings rose 0.2c. per lb., on an average, over last week's quotations at Cincinnati. Higher prices are being paid for scrap copper and zinc. Electrolytic copper is off ¼c. and solder, ⅛c. per lb. in the New York warehouses.

(All prices as of Jan. 26, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	25.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	16.50@17.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	22.26
PITTSBURGH, including freight charge ($1.75) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35	3.25	3.90*
No. 12	2.06@2.15	3.40	3.30	3.95*
No. 14	2.15@2.25	3.45	3.35	4.00*
No. 16	2.25@2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.55@2.65	3.60	3.40	4.00
No. 22	2.70@2.80	3.75	3.55	4.15
No. 24	2.75@2.85	3.80	3.60	4.20
No. 26	2.85@2.95	3.90	3.70	4.30
No. 28	3.00@3.10	4.50	3.85	4.45
Galvanized				
No. 10	2.80	3.95	3.75	4.25
Nos. 12 to 14	2.90	4.05	3.85	4.35
No. 16	3.00	4.15	3.95	4.45
No. 18	3.15	4.30	4.10	4.60
No. 20	3.30	4.45	4.30	4.75
No. 22	3.35	4.50	4.35	4.80
No. 24	3.60	4.65	4.45	4.95
No. 16	3.75	4.90	4.70	5.20
No. 28	4.00	5.15	4.95	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Glav.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

— Thickness — Decimal Fractions	B.w.g. and	Outside Diameter in Inches ¼	⅜	½	⅝	¾	1	1⅛	1¼
		Price per Foot							
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049"	18	.17	.18	.19	.20	.21	.23	.25	
.065"	16	.19	.20	.21	.22	.23	.25	.27	
.083"	14	.20	.22	.23	.24	.25	.27	.29	
.095"	13	.21	.23	.25	.26	.27	.29	.31	
.109"	12	.22	.24	.26	.27	.28	.30	.32	
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33	
.134"	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	4.00†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ⅛@½-in. thick. †250 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:			
Copper, electrolytic, New York			17.50
Tin, Straits, pigs, New York			52.75
Lead, pigs, E. St. Louis	6.50	New York	8.00
Zinc, slabs, E. St. Louis	6.35	New York	8.00

	New York	Cleveland	Chicago
Antimony, slabs	12@13	12.75	14.25
Copper sheets, base	25.87½	25.87½	25.37½
Copper wire, base	22.25	22.50	18.12½*
Copper bars, base	24.37½	24.37½	24.37½
Copper tubing, base	27.12½	27.50	26.62½
Brass sheets, high, base	21.25	21.25	20.75
Brass tubing, high, base	26.12½	26.12½	25.62½
Brass rods, high, base	19.00	19.00	18.50
Brass wire, high, base	21.75	21.75	21.25

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	24.30	24.30
Zinc sheets (casks).....	10.00@10.50	11.00	10.11
Solder (½ and ½).....	34.50	34.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			67.00
Commercial genuine, intermediate grade.....			53.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.25

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold rolled.....	53.00	40.00†
Tubing.....	75.00*	90.00
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	14.87½@14.75	14.25	13.25 @13.75
Copper, heavy, and wire..	13.87½@14.75	13.75	12.67½@13.00
Copper, light, and bottoms	12.50 @13.00	11.50	11.50 @12.00
Heavy lead.....	5.25 @ 5.50	6.25	4.75 @ 5.25
Tea lead.....	3.62½@ 4.12½	4.25	3.75 @ 4.25
Brass, heavy, yellow.....	8.12½@ 8.62½	9.00	8.25 @ 8.75
Brass, heavy, red.....	11.00 @11.50	11.75	10.75 @11.25
Brass, light.....	7.00 @ 7.37½	7.25	7.25 @ 7.75
No. 1 yellow rod turnings.	9.25 @ 9.75	9.50	9.25 @ 9.75
Zinc.....	3.50 @ 3.75	3.25	3.00 @ 3.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†.....	.16@.16½	38.00 per M	.16
Sal soda, per lb.....	.02	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.108	.11	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.30	.36	.35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales or less.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0324
Cold drawn shafting...	per lb..	.034	.034	.033
Brass rods.....	per lb..	.1875	.1825	.165
Solder (½ and ½).....	per lb..	.3475	.3575	.3675
Cotton waste, white...	per lb..	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	3.59	3.59	3.10
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.30	.30	.27
Belting, leather, medium.....	off list..	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs...	off list..	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper.....	$4.05	$4.29	$4.29
Emery cloth.....	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper.....	2.04	2.04	2.04
Cloth.....	3.59	3.59	3.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville, 2.75@2.85		
Coke, prompt foundry, per net ton...	Connellsville, 3.75@4.50		
White lead, dry or in oil...	100 lb. kegs....	New York, 13.25	
Red lead, dry.....	100 lb. kegs....	New York, 13.25	
Red lead, in oil.....	100 lb. kegs....	New York, 14.75	

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts, square heads and nuts:	Full Kegs or Cases
Up to ¾ x 6-in.....	55%
Larger, up to 1 x 30-in.....	50%
1¼ and 1½ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square or hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including $\frac{7}{16}$-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Mich., Wyandotte — All Metal Products Co., A. W. Edwards—complete conveyor system for handling guns and parts for proposed 1 story metal products factory. Estimated cost $50,000.

N. Y., Brooklyn—Superior Ash Can Mfg. Co., 113 Chester St., M. Passmein, Pres.—tools and equipment for proposed shop at 101st St. and Foster Ave. Estimated cost $40,000.

O., Cleveland—McCarthy Mfg. & Supply Co., West 67th St. and Madison Ave. (aluminum pipe)—power punch press, light work, 7 in. center bed.

O., Cleveland—Parker Appliance Co., 10320 Berea Rd.—No. 2 plain milling machine with vertical attachments.

O., South Euclid (br. Cleveland)—Ohio Cut Stone Co., C. R. Yanson, 2066 Random Rd., Cleveland—10 ton crane for proposed 1 story, 65 x 117 ft. shop, here. Estimated cost $50,000.

Ont., Hamilton — International Airways Ltd., R. O. Denman, Mgr., 156 Charlton Ave. W.—machinery and equipment for proposed hangar and shops. Estimated cost $60,000.

Ont., Port Colborne — International Nickel Co., J. Agnew, Mgr.—complete machinery and equipment for proposed nickel refinery plant. Estimated cost $50,000.

Ont., Welland — Joseph Stokes Rubber Co., John St. P. O. Gunkel, Mgr.—machinery and equipment for the manufacture of battery containers for proposed 50 x 200 ft. factory. Estimated cost $50,000.

Opportunities for Future Business

Ala., Bessemer — Pullman Car & Mfg. Co., 79 East Adams St., Chicago, Ill., is receiving bids for the construction of 200 x 1,500 and 150 x 1,200 ft. car shops, etc. here. Estimated cost $3,000,000. Noted Dec. 27.

Ala., Birmingham—Tennessee Coal, Iron & Railroad Co., G. G. Crawford, Pres., B. M. Bldg., plans to expend $2,000,000 during 1920 for extensions and improvements to plant at Fairfield. Plans include additions to twelve sheet mills.

Calif., Emeryville—Western Electric Co., 680 Folsom St., San Francisco, is receiving bids for the construction of a 5 story factory here. Estimated cost $500,000. Private plans. Noted Sept. 6.

Calif., Inglewood—Moreland Aircraft Co., will soon award contract for the construction of an 80 x 200 ft. airplane factory at Mines Field. Estimated cost $250,000. Austin Co. of California, 777 East Washington St., Los Angeles, Archt.

Calif., Los Angeles — Merchants Garage Bldg. Corp., Inc., is having preliminary plans prepared for a 12 story garage, etc., at Olive St. and 6th and 7th Sts. Estimated cost $750,000. W. C. Pennell, 804 South Vermont Ave., Archt.

Calif., Oakland — Boiler Tank & Pipe Co., 4061 Hollis St., Piedmont, will build a boiler shop at 75th and Belley Sts., here. Estimated cost $60,000. Private plans. Noted Nov. 15.

Calif., Van Nuys — Commercial Aircraft Corp., c/o M. M. Falk, Washington Bldg., Los Angeles, Archt., is having plans prepared for a 1 story, 85 x 225 ft. airplane factory, including 50 x 50 ft. paint shop here.

Conn., Berlin — Prentice Mfg. Co., G. Prentice, awarded contract for the construction of a 2 story factory. Estimated cost $40,000.

Conn., Bridgeport—Blue Ribbon Service Inc., 554 Fairfield Ave., will soon award contract for the construction of a 1 story, 30 x 140 and 30 x 50 ft. brake testing and auto sales vulcanizing building on John St. Estimated cost $50,000. F. J. Dixon, 945 Main St., Archt.

Conn., Hartford — Delanley Chevrolet Co., 80 Washington St., awarded contract for a 2 story, 73 x 193 ft. sales and service building at Farmington Ave. Estimated cost $100,000.

Conn., Hartford — Hartford Special Machinery Co., 287 Homestead Ave., had plans prepared for a 1 and 2 story factory. Estimated cost $40,000. Buck & Sheldon Inc., 60 Prospect St., Archts.

Conn., New Haven — A. C. Gilbert Co., Blatchley Ave., manufacturers of portable fans, awarded contract for the construction of a 2 story, 32 x 54 ft. factory. Estimated cost $40,000.

Conn., New London—A. B. Neimon, 36 Cleveland St., awarded contract for the construction of a 1 story, 75 x 125 ft. repair and service garage on Jay St. Estimated cost $40,000.

Conn., Waterbury—New York Auto Body Co., 442 Meadow St., had plans prepared for a 1 story, 60 x 115 ft. addition to plant. Estimated cost $40,000. A. B. Fucito & Sons, 409 Washington Ave., Archts.

Ill., Belleville — Baker Stove Co., 905 Freeburg Ave., awarded contract for a 2 story, 128 x 144 ft. stove factory at Cleveland and Freeburg Aves. Estimated cost $40,000.

Ill., Chicago — Meaker Co., 1249 Fulton St., manufacturers of galvanizing equipment, etc. has work under way on the construction of a factory 55th Ave. and 16th St.

Ill., Chicago—Western Electric Co., 48th Ave. and West 22nd St., awarded contract for extension and reconstruction of a cable plant at Hawthorne Works here. Estimated cost $1,500,000.

Ill., East St. Louis—East St. Louis Casting Co., 16th and Kansas Sts., awarded contract for a 1 story, 110 x 240 ft. foundry at St. Clair Ave. and Alton and Southern Rd.

Ill., East St. Louis—Mobile & Ohio R.R. Co., St Louis, Mo., is receiving bids for the construction of a round house and shops here. Estimated cost $225,000. B. A. Wood, Ch. Engr.

Ind., Alexandria—Banner Rock Products Co., subsidiary of Johns-Manville Co., Madison Ave. and 41st St., New York, N. Y., will build addition to plant on West Alexandria St. here for the manufacture of mineral wool products used in refrigeration plants, etc. Estimated cost $100,000.

Ind., vansville — Evansville Malleable Castings Co., L. P. Edwards, Mgr., 2549 East Colm St., plans addition to factory.

Ind., Indianapolis—Chevrolet Motor Co., 3044 Grand Blvd., awarded contract for a 2 story, 75 x 130 ft. garage, etc. at 34th and Indianapolis Sts. Estimated cost $150,000. R. Caldwell, 239 Cumberland St., Archt. Jones-Whiteker Co., 345 North Capitol Ave., Archt.

Ia., Des Moines—Chicago, Rock Island & Pacific Ry. Co., La Salle St., Station, Chicago, Ill., plans the construction of a roundhouse and shop at 5th Ave. and Third St. here. Estimated cost $100,000. W. H. Petersen, Ch. Engr.

Ia., Des Moines—Des Moines Steel Tank Co., J. H. Albrecht, Pres. 1819 East Court St., plans a 1 story factory at Mattern St. and Delaware Ave. Estimated cost including equipment $50,000.

Ia., Fort Dodge—Thieman Mfg. Co., A. E. Thieman, Mgr., Albert City, manufacturers of agricultural implements, plans a 1 story factory here. Esimated cost $80,000

Ia., Waterloo—H. Burd & G. Behrens, awarded contract for a 1 story, 60 x 100 ft. garage at 5th Ave. and Washington St. Estimated cost $25,000. Ralston & Ralston, 218 Pioneer National Bank Bldg., Archts.

Kan., Wichita — Knoll Aircraft Co., c/o Wichita Airport, awarded contract for the construction of a 2 story, 150 x 200 ft. airplane factory. Estimated cost $75,000.

Ky., Lexington — Consolidated Coach Corp., plans a 2 story, 125 x 150 and 115 x 300 ft. machine shop and garage, etc. Estimated cost $150,000. Frankel & Curtis, Archts.

Ky., Paducah—Ohio River Sand & Gravel Co., plans to rebuild machine shop, etc. recently destroyed by fire.

Me., Belfast—City Vulcanizing Co., Edwards Sales Co., 443 Congress St., Portland, Archt., is having revised plans prepared for a 2 story repair and service garage on Main St. Former bids rejected. Noted Oct. 18.

Me., Portland—Schwartz & Rhodes, 102 Exchange St., awarded contract for a 1 and 2 story, 60 x 215 ft. repair and service garage on Forest Ave.

Me., South Portland (Br. Portland)—Hunnewell Estate, c/o Edwards Sales Co., 443 Congress St., Archt. will soon receive new bids for a 1 story, 90 x 120 ft. repair and service garage on Main St. Estimated cost $45,000. Noted Nov. 22.

Md., Baltimore—Hutzler Bros., Howard and Clay Sts., will soon award contract for a 4 story, 128 x 308 ft. garage, etc. at Saratoga, State and Mulberry St. J. E. Sperry, Calvert Bldg., Archt. H. F. Doellman, 516 North Charles St., Engr.

Md., Towson—Black & Decker Mfg. Co., A. G. Decker, East Pennsylvania Ave., Baltimore, awarded contract for addition to plant here. Estimated cost $100,000.

Mass., Beverly — J. Prevetsky, Rantoul St., plans a 1 story repair and service garage. Estimated cost $40,000. Private plans.

Mass., East Springfield (Boston P. O.)—Westinghouse Electric & Mfg. Co., Page Blvd. East., awarded contract for the construction of radio broadcasting building. Estimated cost $150,000. B. H. Prack, c/o owner, archt.

Mass., Lynn—Ravin & Gordon, 1 Market St., had plans prepared for a 1 story repair and service garage on Summer St. Estimated cost $80,000. F. A. Norcross, 46 Cornhill, Boston, Archt.

Mass., Newton (Boston P.O.)—J. P. Switzer, 151 Adams St., is receiving bids for a 1 story garage and repair shop on Watertown St. Estimated cost $40,000. C. S. J. White, 259 Walnut Ave., Archt.

Mass., Roxbury (Boston P.O.)—B. F. Hutchins, 680 Columbus Ave., awarded contract for a 2 story garage and repair shop at Columbus Ave. and Davenport St. Estimated cost $50,000.

Mass., Somerville (Boston P.O.)—C. & H. Co., 16 New Cross St., awarded contract for a 1 story. 95 x 100 ft. repair and service garage on Garfield Ave. Estimated cost $40,000.

Ind., Plymouth—Plymouth Body Works, F. Cullison, 114-122 East La Porte St., plans a 1 story factory. Estimated cost $50,000. Private plans.

Mass., Somerville (Boston P.O.)—E. M. Cremen, 10 Union Sq., will build a 1 story, 150 x 160 ft. repair and service garage at 113 Central St. Estimated cost $50,000. Noted Jan. 3.

Mass., Springfield—C. E. Day, Talcott Ave., is having plans prepared for a 5 story, 68 x 106 ft. garage at Pynchon and Columbus Ave. Estimated cost $140,000. M. W. Maloney, 23 Pearl St., Archt.

Mass., West Springfield—J. Balestri, Exposition Terrace, Springfield, awarded contract for a 2 story, garage and repair shop at Memorial Ave. and Normal St. F. A. Calkins, 1509 Main St., Springfield, Archt.

Mich., Marysville—Prest Metals Co. of America, plans a 2 story, 50 x 66 ft. press shop factory at Hogedon St. Estimated cost 40,000. G. L. Harvey, Federal State Bank Bldg., Port Huron, Archt.

Mich., Detroit—Dept. of Public Works, City Hall, will soon award contract for the construction of an airport including machine shops, power house, administration building, etc. at Gratiot and Connors Aves. Estimated cost $1,000,000. L. Kamper Inc., Cass Ave., Archt., P. A. Fellows, City Engr.

Mich., Wyandotte — All Metal Products Co., A. W. Edwards, plans the construction of a 1 story metal products factory at Labadie and D. T. and I. Ry. Estimated cost $50,000. Private plans.

Minn., Minneapolis—Brooks Parlor Furniture Co., A. Brooks, Pres., 1115 East Hennepin Ave., plans the construction of a factory. Estimated cost $200,000. Architect not selected.

Minn., Minneapolis — Pioneer Gravel Equipment Mfg. Co., E. E. Ellertson, Pres., 2505 University Ave. S. E., will soon award contract for a 1 story, 180 x 200 ft. factory. Estimated cost $60,000. Sund & Dunham, 512 Essex Bldg., Archts.

Minn., St. Paul—C. F. Arrol, 1491 Blair St., awarded contract for a 1 story, 120 x 120 ft. garage at Fourth St. and Pleasant Ave. Estimated cost $100,000.

Minn., St. Paul—Donaldson Co., Inc., 693 Raymond Ave., manufacturers of sheet metal products, awarded contract for a 1 story, 85 x 130 ft. factory. Estimated cost $25,000. Noted Dec. 13.

Minn., St. Paul—Ten Minute Auto Washing Corp., W. P. Driscoll, Pres., 285 West University Ave., awarded contract for the construction of a 120 x 120 ft. garage at University Ave. and Aldien St. Estimated cost $40,000.

Minn., St. Paul—The White Co., A. P. Dorrance, Mgr., awarded contract for a 1 story garage at 8th and Wacouta Sts. Estimated cost $30,000. Private plans.

Mo., Richmond Heights—United Lumber Co., Sixth and Chauteau Sts., St. Louis, has acquired a site and plans the development of a complete lumber yard here. Plans for building will be complete about May. Estimated cost $100,000.

Neb., Omaha—J. L. Brandeis & Sons, 16th and Douglas Sts., plans the construction of a 5 story garage between 17th, 18th and Dodge Sts. Estimated cost $500,000. G. B. Prinz, Omaha National Bank Bldg., Archt.

N. H., Dover—Kidder Press Co., Broadway, awarded contract for a 1 story, 55 x 200 ft. addition to machine shop. Noted Jan. 24.

N. J., Bogota—F. Conderton and E. Tanburelli, c/o J. L. T. Tillack, 173 Main St., Hackensack, Archts., is having plans prepared for the construction of a 4 story garage, etc., on Elm Ave., here. Estimated cost $150,000.

N. J., Jersey City—Smooth-On Mfg. Co., 572 Communipaw Ave., will soon receive bids for a 3 story factory. Estimated cost $50,000. Dodge & Morrison, 160 Pearl St., New York, N. Y., Archts.

N. J., Kearny—H. H. Oliver, 319 Kearny Ave., awarded contract for a 3 story, 50 x 200 ft. garage and sales and service station at Kearny and Maple Ave. Estimated cost $150,000.

N. J., Newark—Gamno Meter Co., 296 South St., is receiving bids for a 2 story, 35 x 130 ft. addition to plant. Estimated cost $40,000. Taylor & Knight, 60 Park Pl., Engrs.

N. J., Passaic—A. Garth, 14 Grove St., will receive bids about Feb. 1 for a 1 story, 140 x 150 ft. garage at 102-108 South Gregory Ave. Estimated cost $150,000. F. P. Friedman, 395 Springfield Ave., Newark, Archt.

N. Y., Brooklyn—Bee Dee Realty Corp., P. Finkelstein, Pres., 32 Court St., plans a 2 story, 99 x 100 ft. garage at New York and Troy Aves. Estimated cost $60,000. W. F. Regan, 72 Willoughby St., Archt.

N. Y., Brooklyn — Dept. of Mental Hygiene, Albany, will receive bids until Feb. 27 for the construction of a work shop,, etc,. at Brooklyn State Hospital, here.

N. Y., Brooklyn—Lapedus & Fink, 495 East Third St., plans the construction of a 3 story, 50 x 100 ft. garage at Ave. Q. and 10th St. Estimated cost $50,000. W. A. Lacerenga, 26 Court St., Archt.

N. Y., Brooklyn—M. S. Homes Corp., J. Minz, Pres., 8769 23rd Ave., plans the construction of a 3 story, 25 x 89 ft. garage, etc. at Clark St. and Chester Ave. Estimated cost $65,000. S. Gardstein, 44 Court St., Archt.

N. Y., Brooklyn — S. Manley, c/o M. Klein, 65 Court St., Archt., plans the construction of a 1 story, garage on Lynch St. Estimated cost $40,000.

N. Y., Brooklyn—Masonry Waterproofing Co., 307 Herkimer St., plans the construction of a 2 story, 100 x 240 ft. garage at Herkimer St. and East Brooklyn Ave. W. F. Doyle, 11 John St., New York, Archt. Maturity May. Noted Jan. 3.

N. Y., Brooklyn—P. Morgen, 239 80th St., plans the construction of a 1 story, 100 x 148 ft. garage at Graves End Ave. and Kingshighway. Estimated cost $40,000. H. M. Sushan, 369 Fulton St., Archt.

N. Y., Brooklyn—M. Stark, 1679 Eastern Parkway, plans a 2 story, 140 x 200 ft. garage at St. Marks and East Hopkinson Aves. Estimated cost $150,000. J. Fein, 1773 Pitkin Ave., Archt.

N. Y., Brooklyn—M. Weber, 24 University Pl., New York, plans a 2 story, 90 x 212 ft. garage at Hawthorne St. and New York Ave. Estimated cost $120,000. W. F. Doyle, 11 John St., Archt.

N. Y., Brooklyn—Wisgrau Realty Operators, S. Wechsler, Pres., 37 St. Pauls' Pl., plans an 8 story, 90 x 150 ft. garage at Atlantic Ave. and Boerum St. Estimated cost $450,000. W. Richter, 301 Elmwood Ave., Archt.

N. Y., Buffalo — Wire Wheel Corp. of America, H. G. Jackson, Pres., 1700 Elmwood Ave., had plans prepared for the construction of a 3 story factory. Townsend & McNeil, Dun Bldg., Archts.

N. Y., Long Island City—D. H. Dugan, 288 South 5th St., Brooklyn, will build a garage at 97th Ave. and 100 to 101st Sts. Estimated cost $40,000. H. Holder, 242 Franklin Ave., Archt.

N. Y., Malone—Manson Bros. plans the construction of a 2 story, 85 x 120 ft. garage on Pearl St. Estimated cost $40,000. J. Gibbs, Malone, Archt.

N. Y., New York—M. Allen, 1122 Anderson Ave., plans the construction of a 1 story, 50 x 184 ft. garage at 167th St. and Ogden Ave. Estimated cost $40,000. W. F. Doyle, 11 John St., Archt. Maturity March. Noted Dec. 13.

N. Y., New York—S. Bier, 980 49th St., plans the construction of a garage at Fulton St. and Hopkinson Ave. Estimated cost $50,000. C. Goodman, 375 Fulton St., Archt.

N. Y., New York—Corp., c/o R. Bernson, 1306 Jerome Ave., will build a garage at Jerome Ave. and Clinton Pl. Estimated cost $40,000. W. Shary, 41 Union Sq., Archt.

N. Y., New York—Corp., c/o M. S. Finesilver, 149 Broadway, plans the construction of a 6 story garage at 136 West 99th St. Estimated cost $100,000. R. Teichman, 66 Beaver St., Archt.

N. Y., New York—Dept. of Water Supply, Gas Electricity, Municipal Bldg., is having plans prepared for a 2 story, 50 x 112 ft. repair shop at 203rd St. and Webster Ave. Estimated cost $45,000. W. Shary, 41 Union Sq., Archt.

N. Y., New York—East 52nd St. Realty Corp., A. Valle, Pres., 194 Bowery, plans a 5 story, 75 x 103 ft., garage at 403 East 52nd St. Estimated cost $150,000. L. A. Steinart, 194 Bowery, Archt.

N. Y., New York—C. K. Eberhard, 530 East 86th St., plans the construction of a 2 story, 57 x 177 ft. garage at Boston Rd. and Bryant Ave. Estimated cost $40,000. Cohen & Siegel, 45 West 57th St., Archts.

N. Y., New York—Goodlan Realty Corp., V. Pascal, Pres., 27 Cedar St., plans a 2 story, 112 x 112 ft. garage at Summit Ave. and 166th St. Estimated cost $40,000. M. J. Ort, 424 East 149th St., Archt.

N. Y., New York—Interboro News Co., 525-531 West 52nd St., awarded contract for the construction of a 7 story, 100 x 100 ft. garage, shop, paint shop, etc.

N. Y., New York—A. G. Mascicel, 212 East Burnside Ave., plans a 2 story, 105 x 234 ft. garage at 3rd Ave. and 178th St. Estimated cost $50,000. W. F. Doyle, 11 John St., Archt.

N. Y., New York—Mulford Mayflower Corp., A. Cole, Pres., 45 West 57th St., plans a 2 story, 50 x 190 ft. garage at Mayflower and Morris Park. Estimated cost $40,000. Cohen & Siegel, 45 West 57th St., Archts.

N. Y., New York — Nichola & Caterina Seiscente, 305 East Kingsbridge Rd., plans the construction of a 2 story, 75 x 178 ft. garage at Webster Ave. and 204th St. Estimated cost $40,000. J. P. Boyland, 305 East Kingsbridge Rd., Archt. Maturity March. Noted Dec. 13.

N. Y., New York—Thousand Eight Hundred Forty Six Webster Ave. Corp., J. McGinnis, Pres., 3477 Knox Pl., plans the construction of a 1 story, 79 x 131 ft. garage at Cromwell Ave. and West 170th St. Estimated cost $40,000. J. P. Boyland, 305 East Kingsbridge Rd., Archt.

N. Y., New York—Weltmore Realty Co., S. Elliot, Pres., 274 Madison Ave., plans the construction of a 2 story garage, etc., at 265 Sherman Ave. Estimated cost $125,000. Bark & Djorup, 1351 Broadway, Archts. Maturity March. Noted Sept. 27.

N. Y., New York — Schacht Holding Corp., 54 West 174th St., plans the construction of a garage on White Plains Ave. and Britton St. Estimated cost $45,000. Glick & Duma, 400 East Fordham Rd., Archts. Maturity April. Noted Dec. 13.

N. Y., Niagara Falls—Corp., c/o F. W. Moe, 21 East 40th St., plans the construction of a 4 story garage at Elk Pl. and First St. Estimated cost $300,000.

N. Y., Rochester—Eastman Kodak Co., 343 State St., awarded contract for addition to plant. Estimated cost $200,000.

N. Y., St. George (br. Staten Island) — F. Coonley, 107 Central Ave., plans the construction of a 6 story, 75 x 100 ft. garage at Montgomery Ave. and Fort Pl. Estimated cost $150,000. Maturity May. Noted Nov. 15.

N. Y., Woodside—E. Ruth, Jr., 129 Oxford Blvd., Garden City, plans a 2 story, 90 x 200 ft. garage at 60th St. and Roosevelt Ave. Estimated cost $85,000. C. L. Varrone, 166 Corona Ave., Archt.

N. Y., Yonkers — A. Buhremeister, 252 McLean Ave., will soon award contract for a 100 x 125 ft. garage on McLean Ave. Estimated cost $50,000. W. C. Nilson, 643 Van Cortland Park Ave., Archt.

N. Y., Yonkers—R. Chiasclone, 135 Oak St., plans a 2 story, 100 x 150 ft. garage at 220 McLean Ave. Estimated cost $150,000. Snyder & Snyder, 2 Palisade Ave., Archts.

N. Y., Yonkers—J. D. Sorte, School St., plans a 78 x 100 ft. garage at 155 Oak St. Estimated cost $40,000. C. J. Landi, 4 Page St., Archt.

N. D., Minot — Stearns Motor Co., 1 Second St. N.W., plans a 3 story, 140 x 108 ft. garage. Estimated cost $200,000. Bughenhagen & Molandor, Archts.

O., Canton—Timken Roller Bearing Co. plans the construction of two 1 story, 100 x 386 and 98 x 189 ft. factory buildings, also 320 x 450 ft. tube mill. Estimated cost $40,000, $40,000 to $50,000 and $500,000 respectively. Private plans.

O., Cincinnati—City awarded contract for a 1 story repair shop and hangar on Davis Lane. Estimated cost $62,000.

O., Cleveland — R. A. Buss Motor Co., 4311 Mayfield Rd., awarded contract for a 1 story, 60 x 138 ft. garage at Mayfield and Sheffield Rds. Estimated cost $50,000.

O., Cleveland—Consolidated Cartage & Storage Co., 1292 West Third St., awarded contract for a 1 story, 120 x 170 ft. garage at 2501 Orange Ave. Estimated cost $40,000.

O., Cleveland—M. A. Eiben, 4116 Leading Ave., blower manufacturers had plans prepared for a 1 story, 68 x 115 ft. addition to factory at 6309 Barberton Ave. Estimataed cost $40,000.

O., Cleveland—Manufacturers Brush Co., R. R. Radinse, Pres., 1950 West 114th St., is receiving bids for a 1 story, 80 x 240 ft. factory, etc., on Elmwood Ave. Estimated cost $60,000. Private plans.

O., Cleveland—National Telephone Supply Co., F. P. Auxer, Pres., 5100 Superior Ave., is having plans prepared for a 2 story addition to factory. Estimated cost $50,000. G. S. Rider Co., Century Bldg., Archt.

O., Cleveland—Ohio Piston Co., C. Birnbaum, Pres., 5337 St. Clair Ave., plans a 2 story addition to factory. Estimated cost $40,000. Architect not announced.

O., Cleveland—Pipe Machine Co., W. G. Benninghoff, Pres., 930 East 70th St., will soon award contract for a 1 and 2 story, 30 x 50 and 40 x 45 ft. factory, etc. Estimated cost $40,000. Kalsch & Hoefler, 4500 Euclid Ave., Archts.

O., Cleveland—Sterling Brass Co., S. L. Weil, Pres., 9600 St. Catharine Ave., plans the construction of a chrome nickel plant at East 96th St. and St. Catherine Ave. Estimated cost $60,000. Architect not selected.

O., Columbus—Columbus Aircraft Corp., A. J. Frye, 767 North 4th St., plans the construction of a 1 story factory at North Columbus Airport.

O., Columbus—Columbus Heating & Ventilating Co., G. C. Bowman, Pres., 425 West Town St. awarded contract for a 3 story, 80 x 90 ft. factory at 425 West Tower St.

O., Columbus — Jaeger Machine Co., 518 Dublin Rd., awarded contract for addition to plant. Estimated cost $40,000.

O., Dayton—G. S. Ball, 20 East 5th St., plans the construction of a 2 story auto sales and repair shop at Main and Foraker Sts. Estimated cost $40,000. Architect not selected.

O., Delphos—Gramn Motor Co. will build a 2 story addition to auto assembly plant. W. M. DeKalb, 404 American Bank Bldg., Lima, Archt.

O., Hamilton — The Estates Stove Co. awarded contract for the construction of a plant on East Ave. Estimated cost $75,000. F. J. Mueller, Archt. C. Kiefer, Schmidt Bldg., Cincinnati, Engr.

O., Maple Heights (br. Cleveland)—Lake Erie Metal Products Co., J. F. Strand, Gen. Mgr., Dunham Rd., awarded contract for a 1 and 2 story, 75 x 100 ft. factory. Estimated cost $40,000. Noted Dec. 20.

Okla., El Reno—Chicago, Rock Island & Pacific Ry. Co., La Salle St. Station, Chicago, Ill., plans the construction of a steel car repair shop, here. Estimated cost $370,000. C. A. Morse, Ch. Engr.

Okla., Oklahoma City—Oklahoma Structural Steel Co. is having preliminary plans prepared for the construction of a new steel plant. Estimated cost $500,000.

Pa., Allentown — H. B. Schadt, c/o Jacoby & Everett, Commonwealth Bldg., 510-12 Hamilton St., Archts., plans the construction of a 6 story garage and sales and service station. Estimated cost $150,000.

Pa., Ambridge—A. M. Byers Co., Clark Bldg., Pittsburgh, manufacturers of pipe, is having plans prepared for the construction of a plant here. Estimated cost $10,000,000. H. A. Brassert & Co., 310 South Michigan Ave., Chicago, Ill., Engrs. Noted Dec. 13.

Pa., Bristol—Superior Zinc Corp., C. E. Monroe, Supt., Radcliffe and Monroe Sts., is having plans prepared for the construction of a 2 story factory. Estimated cost $25,000. G. Tomlinson & Sons, 171 Samsm St., Engrs.

Pa., Colfax — Duquesne Light Co., 6th Ave., Pittsburgh, will build a 1 story, 60 x 135 ft. machine shop here. Estimated cost $40,000. Private plans.

Pa., Philadelphia—Fox Garage, plans a 3 story, 70 x 186 ft. garage at Second and Delancy Sts. B. Shulman, 1722 Arch St., Archt.

What This Section Is

Machinery Requirements and Industrial Construction is a reliable machinery market, because every item is reported first-hand by our own correspondents, scattered over the United States and Canada. These leads are verified by our men. We do not use newspaper clippings, nor do we listen to any hearsay or rumors. These sales leads are as accurate as our men can make them, and as timely as weekly publication will permit.

This market is for *American Machinist* subscribers. It covers the same machinery fields as does the paper. Here will be found inquiries for machine tools, presses, hammers, welding, forging and heat treating equipment, and other machinery for the shop.

Here also will be found reports of proposed industrial construction, where sooner or later machinery will be needed.

Are you making the most of the opportunities listed here?

Pa., Pittsburgh—Pierpont Motor Co., 5001 Baum Blvd., plans a 2 story, 105 x 212 ft. addition to garage. Estimated cost $150,000. C. D. Colley, 541 3rd Ave., Archt.

Pa., Pittsburgh — E. L. Wiegand Co., First Ave., awarded contract for the construction of a 1 and 2 story, 84 x 140 ft. plant on Thomas Blvd. Estimated cost $100,000. B. H. Prack, Martin Bldg., Archt.

Pa., Pittsburgh—Kerotest Mfg. Co., 2525 Liberty Ave., is having plans prepared for the construction of a 3 story plant. Estimated cost $100,000. J. T. Steein & Son, Vanderbilt Bldg., Archts.

Pa., Pittsburgh—Market House Garage Co. Inc., c/o D. A. Crone, 212 Oliver Ave., Archt. is having plans prepared for a 7 story, 100 x 100 ft. garage on 4th Ave Estimated cost $250,000.

Pa., Philadelphia — International Harvester Co. of America, 2905 North 16th St., will soon award contract for a 1 story, 110 x 225 ft. sales and service station at Erie and F Sts. Private plans.

Pa., Pittsburgh—T. Donaldson, Western Ave. N. S., is receiving bids for a 4 story garage on Western Ave. Estimated cost $200,000. Hunting Davis & Dunnells, Century Bldg., Archts.

R. I., Providence—Franklin Service Station Inc., 241 Dyer St., awarded contract for the construction of a 1 story repair and service garage on Lasalle St. Estimated cost $40,000.

S. D., Sioux Falls — M. Gerin awarded contract for a 1 story, 88 x 140 ft. garage at 11th Ave. and Main St. Estimated cost $50,000. Hugill & Blatherwick, 367 Boyce-rGeeley Bldg., Archts. Chevrolet Sales & Service Co., lessee.

Tenn., Memphis—Murray Body Co. of America, 1424 Aberle St., Detroit, plans the construction of first unit of plant for the manufacture of automobile bodies at Moorehead and White Aves., here. A. Kahn, 1000 Marquette Ave., Detroit, Mich. Archt.

Tex., Abilene — City, c/o W. A. Biney Engr., plans an election Feb. 25 to vote $100,000 bonds for the construction of a municipal airport including hangar, machine shops, etc.

Tex., Clarksville—Southern Pine & Lumber Co., Texarkana, Ark., plans the construction of a large sawmill near here Estimated cost $75,000.

Tex., Corpus Christi—Broadway Properties Inc., plans the construction of a 2 story garage. Estimated cost $20,000 Private plans.

Tex., Kingsville—Missouri Pacific R.R. Co., Missouri Bldg., St. Louis, Mo., will soon award contract for the construction of a coach and mill shop here. Estimated cost $150,000. E. A. Hadley, St. Louis, Ch. Engr.

W. Va., Wierton—Wierton Steel Co., is having plans prepared for the construction of a blast furnace and by product ovens. Estimated cost $1,000,000. Private plans.

Wis., Hartford — Leach & Christenson, will soon award contract for a 2 story, 74 x 118 ft. garage, etc. A. Kuenzi, c/o

Wis., Milwaukee — Industrial Controller Co., F. W. Magin, Secy. and Gen. Mgr., 306 Hanover St., plans a 3 story, 50 x 140 ft. addition to plant for the manufacture of electrical and mechanical controlling devices.

Wis., Milwaukee — Trenkamp Estate, 1365 Buffum St., awarded contract for a 2 story, 150 x 240 ft. garage at East Michigan and Cass Sts.

Wis., Superior—Hussey Motor Car Co. awarded contract for a 1 story, 120 x 140 ft. garage. Estimated cost $40,000. R. C. Buck, U. S. National Bank Bldg., Archt.

Ont., Brantford—Happy Thought Foundry Co., Elgin St., plans a 2 story, 40 x 153 ft. stove mounting and storage building. Estimated cost $50,000. Private plans.

Ont., Toronto — Canadian Wirebound Boxes Ltd., 1000 Gerrand St. E., plans the construction of a 1 or 2 story addition to factory. Estimated cost $50,000. Private plans.

Ont., Toronto—Lawrence Park Garage, 2673 Yonge St., plans a 1 and 2 story, 100 x 100 ft. addition to garage on Yonge St. Estimated cost $60,000. V. L. Morgan & Co., Dufferin St. and Rosemount Ave., Archts. Noted Nov. 22.

Ont., Toronto—MacLean Publishing Co., 149 University Ave., plans the construction of a garage on Dundas St. Estimated cost $150,000. Architect and engineer not selected.

Mexico, Merida, Yucatan — Compania Mexicania de Aviacion, S. A., c/o G. L. Rihl, Pres., Mexico City, plans the construction of an airport terminal including hangar, repair shops, etc. here. Estimated cost $125,000. Baretta-Stiles Co. Inc., National Bank of Commerce Bldg., San Antonio, Tex., Engr.